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# Pre-operative predicton of difficult laparoscopic cholecystectomy

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**Abstract**
**Introduction:** The study's goal was to evaluate the preoperative predictability of challenging laparoscopic cholecystectomy. Factors such as age (>50 years), BMI (≥30 kg/m²), male gender, history of acute cholecystitis, pancreatitis, prior upper abdominal surgeries, gall bladder wall thickness (>3 mm), the presence of pericholecystic fluid, and a white blood cell count (>10,000 cells/mm³) were considered as potential predictors for the need to convert laparoscopic cholecystectomy to open cholecystectomy. This conversion is necessary in 3 to 10% of laparoscopic cholecystectomy cases performed worldwide due to various factors.
**Materials and Methods:** The present study was a prospective study of patients who underwent laparoscopic cholecystectomy during 2 years study period. Patients who met the inclusion criteria are included in the study.
**Results:** Significant predictive factors for difficult laparoscopic cholecystectomy were gall bladder wall thickness more than 3mm, wbc count more than 10000 cells per cubic milli metre and presence of pericholecystic fluid collection.
**Conclusion:** Pre-operative findings of gall bladder wall thickness more than 3mm, wbc count more than or equal to 10000 cells per cubic milli metre and presence of pericholecystic fluid collection can help in the prediction of difficult laparoscopic cholecystectomy. Other factors like old age more than 50 years, male gender, past history of acute cholecystitis and acute pancreatitis and history of upper abdominal surgeries and BMI>30 were not helpful in predicting difficult laparoscopic cholecystectomy preoperatively.

**Keywords:** Gall bladder, laparoscopic cholecystectomy, open cholecystectomy, difficult laparoscopic cholecystectomy

## Introduction

Gall stone diseases affect 3-20% of people living worldwide. Most of the gall stones remain asymptomatic throughout. Only some patients with gall stones shows symptoms like biliary colic, jaundice, fever etc. Usually pain is caused when there is obstruction to cystic duct by calculus [1]. Complications due to symptomatic gall stone disease includes cholecystitis, gall stone pancreatitis, choledocholithiasis with or without cholangitis, chole cysto-chole dohcal fistula,chole- cysto enteric or chole cysto duodenal fistula leading to gall stone ileus and carcinoma gall bladder [1]. First cholecystectomy was performed in 1882. A century later in 1985 the first laparoscopic cholecystectomy was performed. Since then cholecystectomy has undergone many changes like invention of laparoscopic procedure, single port laparoscopic cholecystectomy to performing robot assisted cholecystectomy [2].

With increasing experience gained by the surgeons in this procedure, they started accepting cases which are more challenging and patients who are at high risk, leading to increased complication rates 4 and so the rate of conversion to open cholecystectomy. Among all the laparoscopic cholecystectomies performed worldwide 3 to 10% need conversion to open cholecystectomy [3]. Conventionally laparoscopic procedure is done in all cases if it's not contra-indicated. Laparoscopic cholecystectomy have various advantages like decreased morbidity, decreased stay in hospital, better cosmesis and short time for recovery. However not all laparoscopic cholecystectomies can be finished the same way, conversion to open cholecystectomy is required in some patient's [4].

Various factors are responsible for the conversion of laparoscopic to open cholecystectomy like in cases of acute cholecystitis, anatomic anomalies, massive fibrosis, old age, male gender, history of upper abdominal surgeries and pancreatitis, lack of appropriate laparoscopic

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instruments, gallbladder wall thickness of more than 3 mm, presence of pericholecystic fluid, intraoperative complications like uncontrolled bleeding, injury to the internal organs [5]. But conversion from laparoscopic to open cholecystectomy involves its own complications like increased chances of surgical site and respiratory infections, prolonged hospital stay. So, certain studies were performed to predict the preoperative prediction of difficult 5 laparoscopic cholecystectomy and to predict the conversion from laparoscopic to open cholecystectomy. The aim of the study is to predict and assess the preoperative factors that indicate the likelihood of difficult laparoscopic cholecystectomy and the potential need for conversion from laparoscopic to open cholecystectomy.

## Materials and Methods
The prospective study was carried out in the Department of General Surgery, Mamata General Hospital, Khammam, Telangana from November 2021 to November 2023 with a total of 50 patients admitted to surgical ward. Study was approved by institutional ethics committee and written informed consent was obtained from all patients participating in the study.

**Study Population:** Patients came with complaint of abdominal pain during the study period and subjected for abdominal examination and ultrasound abdomen and necessary investigations and who were positive included in the study.

**Inclusion Criteria:** Patients above 18 years with symptomatic gall bladder disease.

**Exclusion Criteria:** Patients with gall bladder carcinoma.

## Method of Collection of Data
We took detailed history of pain abdomen and duration of symptoms and examination of abdomen. As many authors say extensive investigations were not useful in the management of pain abdomen. In our study we have advised essential laboratory investigations like complete blood picture which include haemoglobin and white blood cell count and specific investigation like ultrasound abdomen for gall bladder wall thickness and pericholecystic fluid collection

**Statistical Analysis:** Analysis of various preoperative risk factors and their relation to the outcome variables was performed using t test. P- value of $< 0.05$ is considered as significant.

## Results

**Table 1:** Gender distribution of cases

| Gender | Number | Percentage |
|---|---|---|
| Men | 20 | 40% |
| Women | 30 | 60% |
| Total | 50 | 100% |

In the study population females are the predominant gender who undergone laparoscopic cholecystectomy (60%). Males account for 40% of cases.

**Table 2:** Correlation between age and surgery duration

| Age | N | % | Duration | P value |
|---|---|---|---|---|
| >65 | 12 | 24 | 130±39.5 minutes | 0.3337 |
| <65 | 38 | 76 | 146.6±50.1 minutes | |

In patients with age >65 years mean duration of surgery was 130±39.5 minutes. In patients with age < 65 years mean duration of surgery was 146±50.1 minutes. The difference between the two groups were not statistically significant with P value of 0.3337. Among the patients in whom surgery duration was prolonged were in the age group of >65 years.

**Table 3:** Corelation between BMI and surgery duration

| Pre-operative risk factor | N | % | Duration | P value |
|---|---|---|---|---|
| BMI>30 | 7 | 14 | 150±39.1 | 0.663 |
| BMI<30 | 43 | 86 | 141.4±49.4 | |

In case with BMI>30 the mean duration of surgery was 150±39.1 and in cases with BMI<30 the mean duration of surgery was 141±49.4. The difference between the two groups was not statistically significant (P-Value 0.663).

**Table 4:** Corelation between Previous history of cholecystitis and surgery duration

| History of cholecystitis | N | % | Duration | P value |
|---|---|---|---|---|
| Present | 29 | 58 | 152.2±47.6 | 0.094 |
| Absent | 21 | 42 | 129.3±46 | |

In patients with past history of cholecystitis the mean duration of surgery was 152.2±47.6.In patients with no past history of cholecystitis the mean duration of surgery was 129.3±46. The difference between the two groups was not statistically significant with P value 0.094.

**Table 5:** Corelation between WBC count and surgery duration

| Wbc count | N | % | Duration | P value |
|---|---|---|---|---|
| >10,000 | 27 | 54 | 154.4±50.3 | 0.05 |
| <10,000 | 23 | 46 | 128.7±41.6 | |

In patients with wbc count more than 10,000 the mean duration of surgery was 154.4±50.3. In patients with wbc count less than 10,000 the mean duration of surgery was 128.7±41.6.The difference between the two groups was statistically significant with P-value 0.05.

**Table 6:** Corelation between Gall bladder wall thickness and surgery duration

| Gall blader wall thickness | N | % | Duration | P value |
|---|---|---|---|---|
| Present | 29 | 58 | 155.2±51.9 | 0.027 |
| Absent | 21 | 42 | 125.2±35.9 | |

In patients with gall bladder wall thickness the mean duration of surgery was 155.2±51.9 and in patients who has normal gall bladder wall thickness the mean duration of surgery was 125.2±35.9. The difference between the two groups was statistically significant with P value 0.027.

**Table 7:** Corelation between presence of peri cholecystic fluid and surgery duration

| Peri cholecystic fluid | N | % | Duration | P value |
|---|---|---|---|---|
| Present | 10 | 20 | 187±63.4 | <0.01 |
| Absent | 40 | 80 | 131.5±36.3 | |

In patients who have evidence of peri cholecystic fluid the mean duration of surgery was 187±63.4 and in patients with no evidence of peri cholecystic fluid the mean duration of surgery was 131.5±36.3. The difference between the two groups was statistically significant with p value-<0.01.

## Discussion

Laparoscopic cholecystectomy has become the preferred treatment worldwide for symptomatic gallbladder disease, offering several advantages over open cholecystectomy, including reduced postoperative pain, quicker recovery, and lower rates of complications, shorter hospital stays, and improved cosmetic outcomes [6]. However, in some cases, laparoscopic cholecystectomy can be challenging and may require conversion to open surgery. Therefore, it is essential to identify factors that can predict the difficulty of the procedure beforehand.

The study divided the patient population into two groups based on the duration of surgery. The first group had surgeries completed in less than two hours, while the second group had surgeries that took two hours or longer. The mean age in both groups was compared and found to be statistically similar, indicating that age did not significantly influence the duration of surgery [7].

Similarly, the study assessed the impact of past cholecystitis history on surgery duration. It was observed that having a history of cholecystitis did not significantly affect the surgical duration [8]. Next, the study considered the total white blood cell (WBC) count as a potential predictor. A patient with WBC counts of 10,000 or more experienced longer surgeries than those with counts below 10,000. This difference was statistically significant, suggesting that an elevated WBC count could be a useful indicator of potential surgical difficulties [9].

The thickness of the gallbladder wall was also analyzed as a predictor. Patients with thickened gallbladder walls had significantly longer surgery durations compared to those with normal wall thickness. This finding implies that gallbladder wall thickness could be a valuable preoperative indicator of surgical complexity [10].

Furthermore, the presence of pericholecystic fluid was examined as a predictive factor. Patients with evidence of pericholecystic fluid collections had notably longer surgery durations compared to those without such evidence. This indicates that the presence of pericholecystic fluid could be a useful preoperative predictor of challenging laparoscopic cholecystectomy.

In conclusion, this study suggests that preoperative findings of gallbladder wall thickness greater than or equal to 3mm, a total WBC count of 10,000 or more cells/cubic millimeter, and the presence of pericholecystic fluid collection can help predict difficult laparoscopic cholecystectomy. However, factors such as old age ($\geq$65 years), male gender, past cholecystitis or pancreatitis history, a history of upper abdominal surgeries, and a BMI of 30 or higher were not found to be reliable predictors of surgical complexity before the procedure.

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