

Original Research Article

A prospective study of preoperative scoring system in predicting difficulty in elective laparoscopic cholecystectomy

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ABSTRACT

Background: Laparoscopic cholecystectomy since its discovery in 1987, has dramatically replaced conventional open cholecystectomy and rapidly became the gold standard for routine gall bladder removal. Today more than 80% of cholecystectomies are carried out laparoscopically. Laparoscopic cholecystectomy although safe and effective, yet poses many difficulties like unclear anatomy, and frozen calots. If risk factors could be reliably identified preoperatively, these factors would aid surgeons in preoperative patient counselling, informed consent, and operative strategy.

Methods: This study conducted over the span of 2.5 years on 66 patients underwent elective laparoscopic cholecystectomy was done to identify risk factors preoperatively and their association with intraoperative difficulty.

Results: Preoperative factors like acute cholecystitis in the past, gall bladder wall thickness and previous history of upper abdominal procedure were found to be directly related to intraoperative difficulty and laparoscopic to open conversion.

Conclusions: Preoperatively with the help this scoring system we can predict difficulty in laparoscopic cholecystectomy.

Keywords: Cholecystectomy laparoscopy, Cholecystitis, Gallbladder

INTRODUCTION

Management of biliary tract disease has evolved from being a major procedure to a relatively safe and a good day care procedure today.¹ Today more than 80% of cholecystectomies are carried out laparoscopically. Laparoscopic cholecystectomy though safe and effective, can be difficult sometimes which could be disastrous while performing it. Various problems faced are difficulty in creating pneumoperitoneum, accessing the peritoneal cavity, releasing adhesions, identifying anatomy, anatomical variation, and extracting the gall bladder. Laparoscopic cholecystectomy with these factors was responsible for prolonged operating time and unfavourable outcomes. Unfortunately, factors indicating a risk for conversion of laparoscopic to open cholecystectomy are unclear. If risk factors could be reliably identified

preoperatively, these factors would aid surgeons in preoperative patient counselling, informed consent, and operative strategy. We aim to identify and analyse risk factors associated with the conversion of laparoscopic cholecystectomy to open cholecystectomy inpatients of our institute.

METHODS

Study type

It was a prospective observational cohort study.

Study place

The study was conducted at the general surgery department at Government Medical College, Aurangabad.

Study period

The study period was over a span of 2.5 years from November 2019 to April 2022.

Inclusion criteria

Patients with cholelithiasis posted for elective laparoscopic cholecystectomy, and chronic calculous and acalculous cholecystitis posted for elective laparoscopic cholecystectomy were included.

Exclusion criteria

Patients with acute cholecystitis, carcinoma gall bladder, and patients not given consent to study are excluded from study.

The evaluation was done based on risk factors and score as per the parameters proposed by *Marek Soltes* and allotted to every patient preoperatively after taking consent.² The score factors were based on the history, physical examination, and ultrasound findings of the patient. A score was given to the patients and they were correlated with intraoperative difficulty in the form of conversion to open cholecystectomy and duration of the procedure.

Ethical committee clearance was taken before starting the study (MUHS/Medical/MUHS-021216/2019 – Synopsis approval number)

Statistical analysis

All the data was filled in Microsoft excel spreadsheet; student t test was used to find the significance of study parameters on continuous scale between two groups on metric parameters. Chi-square test was used to find the significance of study parameters on categorical scale between two or more groups. Data analysis was done with the help of statistical package for the social sciences (SPSS) software trial version 22.

RESULTS

In our study, a total of 66 patients undergoing elective laparoscopic cholecystectomy were analyzed throughout the preoperative, intraoperative, and postoperative course on the basis of the below-mentioned parameters. There were 19 males (28.8%) and 47 females (71.2%). Male to female ratio was 1:2.3.

Table 1: Association of gender with difficulty.

Gender	Male (19)	Female (47)	Total (66)
>90 minutes duration	06 (31.5)	14 (29.8)	20 (30.3)
Lap to open conversion	03 (15.8)	06 (12.8)	09 (13.6)

The highest rate of conversion was seen in the male gender (15.8%) compared to females (12.8%). Male patients had an operating duration of more than 90 minutes (31.6%) compared to females (29.8%) (Table 1).

Out of 20 patients with history of cholecystitis in the past 9 had conversion to Open cholecystectomy and 14 had operative time more than 90 minutes which was 70% compared to 13% longer operative duration seen in no acute cholecystitis in the past group (Table 2).

Table 2: Association of past history of acute cholecystitis with difficulty.

Past history of acute cholecystitis	Present (20)	Absent (46)	Total
>90 minutes	14 (70)	06 (13)	20
Lap to open conversion	9 (45)	0 (0)	09

All 9 patients who underwent conversion to open cholecystectomy had a past history of biliary colic within 3 weeks. 18 (35.3%) patients with biliary colic within the last 3 weeks had an operative time of more than 90 minutes compared to 02 patients (13.3%) of longer operative time in negative biliary colic patients (Table 3).

Table 3: Association of past history of biliary colic with difficulty.

Patients with biliary colic within the last 3 weeks	Present (51)	Absent (15)	Total
>90 minutes	18 (35.3)	02 (13.3)	20
Lap to open conversion	09 (17.6)	00 (0)	09

Out of 3 with upper abdominal procedure, 2 converted to open cholecystectomy which was 66.7% compared to 15.2% conversion in the other group and all 3 had operative duration more than 90 minutes thus signifying that previous abdominal surgeries had a significant impact on the operative time (Table 4).

Table 4: Association of previous abdominal surgery with difficulty.

Patients with previous abdominal procedure	Present (3)	Absent (63)	Total
>90 minutes	03 (100)	17 (26.9)	20
Lap to open conversion	02 (66.7)	07 (15.2)	09

3 patients had GB wall thickening ≥ 4 mm. Out of 3 patients with GB wall thickness > 4 mm, 1 had conversion to open procedure which was 33.3% compared to 12.7% conversion in patients with less GB thickness group. Two

patients had operative time of more than 90 minutes (Table 5).

Table 5: Association of gall bladder wall thickness with difficult laparoscopic cholecystectomy.

Patients with GB wall thickness	≥4 mm (03)	<4 mm (63)	Total
>90 minutes	2 (66)	18 (28.6)	20
Lap to open conversion	01 (33.3)	08 (12.7)	09

Out of 2 patients with hydropic Gall bladder both had conversion and operating time of more than 90 minutes but it is very difficult to comment on the association as the number of patients with hydropic GB is much less (Table 6).

Out of 2 patients of shrunken GB 1 converted to open cholecystectomy which was 50% compared with 18.2% of the and 1 had time more than 90 minutes (Table 7). The maximum number of patients (39.4%) belonged to the score 1 group and the lowest in the score 1 group (1.5%). 5 patients had a score ≥4 (Table 8).

Table 8: Association of score with difficulty.

Score (no. of patients)	0 (10)	1 (26)	2 (22)	3 (3)	≥4 (5)	Total
>90 minutes	1 (10)	03 (11.5)	10 (45.4)	02 (66.6)	04 (80)	20
Conversion to open cholecystectomy	0 (0)	0 (0)	5 (22.7)	1 (33.3)	3 (60)	09

DISCUSSION

Intra-operative findings at the time of cholecystectomy vary according to the clinical presentation and may lead to a range of operative challenges.

The prediction of the difficulty encountered during the procedure can offer the surgeon a range of benefits, including surgical planning, informing the patient, and predicting certain outcomes, such as the potential for conversion to open surgery. In this study, we attempt to study the feasibility of a predictive scoring system in anticipating and preventing complications encountered during 66 patients undergoing laparoscopic cholecystectomy.

Gender

In our study higher rate of conversion was seen in the male gender which was 15.8% compared to females with 12.8% conversion overall. Also, operating duration of more than 90 minutes seen in males was 31.6% compared to 29.8% for females in comparable groups. Thus association of difficulty with the male gender can be established. Studies from Nidoni et al found a conversion rate of 10.8% in males compared to 2.6% conversion in females which was

Table 6: Association of hydropic gall bladder with difficulty.

Patients with hydropic GB	Present (02)	Absent(64)	Total
>90 minutes	02	18	20
Lap to open conversion	02	07	09

Table 7: Association of shrunken gall bladder with difficulty.

Patients with shrunken GB	Present (02)	Absent(64)	Total
>90 minutes	01 (50)	19 (30.1)	20
Lap to open conversion	01 (50)	08 (18.2)	09

The highest rate of conversion is seen in patients with scores ≥4 (60%) and the lowest in scores 0 and 1 group. The highest rate of longer operative time is also seen in the ≥4 score group (80%) and the lowest in the 0 group.

statistically significant ($p=0.034$, 95% confidence interval).³

Acute cholecystitis in the past

In our study 45% conversion rate has been seen in patients with a history of cholecystitis compared to a 13.2% conversion overall making this parameter significant. In a study by Gutt et al, out of 618 patients with acute cholecystitis 304 patients were given immediate laparoscopic cholecystectomy and the other 314 patients were treated conservatively with delayed planned laparoscopic cholecystectomy and the delayed laparoscopic cholecystectomy group had a conversion rate of 11.9% compared to 9.9% conversion in the immediate laparoscopic cholecystectomy group.⁴

Previous upper abdominal surgery or procedure

In our study there was a 66.7% conversion to open cholecystectomy seen in patients with previous upper abdominal surgery compared to a 10.8% conversion in patients with no such history and also 100% of the patients had operative duration of more than 90 minutes making this parameter statistically significant. In a study performed by Ercan et al in 2009, a total of 677 patients were divided into three groups.⁵ When the conversion rate

was compared, 27.27% of patients with prior upper abdominal surgery, 2.82% of patients with lower abdominal surgery, and 25% of patients with both upper and lower abdominal surgeries were converted to open. Thus it is proposed that prior abdominal surgery increases the risk of iatrogenic intestinal damage by causing adhesions or obstructing the visualization of hepatobiliary structures and limiting the working area.⁶

Thickened gall bladder

In our study 33.3% conversion rate was seen in GB wall thickness ≥ 4 mm compared to a 13.6% overall conversion rate which was significant. Also, 33.3% of patients had operative duration >90 minutes making GB wall thickness an important parameter. Various studies have identified gallbladder wall thickness as an independent risk factor.⁷⁻⁹ Wall thickness has been seen to be an indicator of increasing inflammation, so it is not surprising that wall thickness would be associated with increased complications and conversions. It was suggested that the gallbladder wall's thickness makes gripping, moving, and detaching the gall bladder from its bed difficult, resulting in a difficult treatment.

In a study by Raman et al the mean wall thickness was 4.04 ± 2.28 mm, with a range of 1–15 mm.¹⁰ For males the mean was 4.33 ± 2.29 mm, and for females, the mean was 3.97 ± 2.28 mm ($p=0.076$). There were 223 patients (25.5%) in the normal group, 390 patients (44.6%) in the mildly thickened group, 154 patients (17.6%) in the moderately thickened group, and 104 patients in the severely thickened group. There were 68 (7.8%) conversions to open surgery in the study group. The most common reason for conversion was adhesions or extensive inflammation of the gallbladder precluding safe dissection. Other reasons included a friable gallbladder, unclear anatomy, and haemorrhage. The incidence of conversion in each group was 3.1%, 5.1%, 14.9%, and 16.8%, respectively. These differences were highly significant (Pearson Chi-square, $p<0.001$).

Score and difficulty associated

Out of 66 patients, 9 patients had conversion to open cholecystectomy making our conversion rate 13.6%. The reason for conversion was adhesion and difficulty in identifying the Calots's triangle for 6 patients, iatrogenic duodenal perforation for one patient, transverse colon perforation while inserting the Trochars for one patient, and technical difficulty for one patient. The maximum rate of conversion was seen in score ≥ 4 followed by 3 and 2 which was 60%, 33.3%, and 22.7% respectively. Thus we can say that this scoring system has positive predictive value for predicting difficulty intraoperatively.

While the mean conversion rate for the whole series was 13.6%, for risk scores of 0, 1, 2, 3, and 4 it appeared to be 0, 0, 22.7, 33.33 and 75%, respectively. Based on these data, it can be concluded that the mean conversion rate has

low accuracy for a particular patient. Similar conclusions apply to the length of operating time.

Limitations

The small sample size of the study leads to a smaller number of subjects in some parameters which could not be evaluated correctly. This study does not consider many other risk factors causing intraoperative difficulty like obesity, liver cirrhosis, hepatomegaly, stone in the cystic duct. Degree of difficulty is also influenced by the operating Surgeon and in our study multiple surgeons with different approach and experience makes some amount of error.

CONCLUSION

The observations of this study can be described in a nutshell as follows. Our study tries to test the efficacy of a scoring system for predicting difficult laparoscopic cholecystitis as suggested by Marek Soltes and has similar results in detecting difficulty, thus it is safe to say that this scoring system can be used preoperatively for better efficacy of operative procedure. Using simple pre-operative characteristics, this score may reliably predict the chance of a difficult operation, allowing patients to be better selected for day-case surgery and optimizing pre-operative care, assisting with surgery planning and patient education. In order to make more trustworthy evaluations and give better surgical practice, an accurate scoring system is required. The grading method aids surgeons in making consistent predictions regardless of their clinical expertise. A well-defined cut-off score could clarify what "difficult laparoscopic cholecystectomy" entails, and doctors from all over the world could better communicate on the subject.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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