

Preoperative Prediction of Difficult Laparoscopic Cholecystectomy

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Abstract: This study has been carried out at our institute during period of February 2016 to November 2016, in all 122 cases were studied. Patients who attended the surgical outpatient department and emergency department were included in the study. All patients presenting in casualty or outpatient department with history suggestive of gall bladder disease were investigated. Abdominal ultrasonography was performed at the time of admission and reviewed 24 hours before the surgery after a 12-hour fast. Patients with ultrasonography suggestive of single or multiple gall stones or acalculous cholecystitis were included in the study. Cases were investigated as mentioned in proforma and selected for laparoscopic cholecystectomy as per inclusion and exclusion criteria. Operation time is taken as indicator of difficulty. A policy of converting to open cholecystectomy: if no progress in dissection of Calot's triangle within 30 minutes, was adopted throughout the study¹⁰. Preoperative clinical parameters like previous acute cholecystitis or pancreatitis, obesity (BMI ≥ 30 kg/m²), sex were evaluated. Their association with conversion of laparoscopic cholecystectomy was studied. Preoperative ultrasonographic parameter like gall bladder wall thickness >3 mm and its association with conversion of laparoscopic cholecystectomy to open cholecystectomy was studied.

Keywords: Laparoscopic cholecystectomy, Open cholecystectomy, difficult cholecystectomy, Predictive factors

1. Introduction

Cholelithiasis is the most common biliary pathology. Gall stones are present in 10-15% of the general population and asymptomatic in the majority $>80\%$

Approximately 1-2% of asymptomatic patients will develop symptoms requiring cholecystectomy per years, making cholecystectomy one of the most common operations performed by general surgeries.

Ultrasound of the abdomen is an extremely useful and accurate method for identifying gallstones and pathologic changes in the gallbladder consistent with acute cholecystitis.¹ Ultrasound of abdomen has a high specificity of $>98\%$ and sensitivity of 95% in diagnosing cholelithiasis.² In addition to identifying gallstones, ultrasound can also detail signs of cholecystitis such as thickening of the gall bladder wall, peri-cholecystic fluid, and impacted stone in the neck of the gallbladder. Dilation of the extra-hepatic (>10 mm) or intra-hepatic (>4 mm) bile ducts suggests biliary obstruction.

The advantages of laparoscopic cholecystectomy over open cholecystectomy were immediately appreciated: earlier return of bowel functions, less postoperative pain, informed cosmesis, shorter length of hospital stay, earlier return to full activity, and decreased overall cost.

Conversion rate in Laparoscopic cholecystectomy is still 1.5 to 19%. Significant independent predictive factors for conversion of laparoscopic cholecystectomy to open cholecystectomy are male gender, previous abdominal surgeries, acute cholecystitis thickened gallbladder wall on preoperative ultrasonography of abdomen and suspicion of common bile duct stones.

Aims and Objectives:

- 1) To study preoperative clinical and sonological factors that predict difficult laparoscopic cholecystectomy.

- 2) To study usefulness of these factors in preoperative planning of patient and surgeon and in determining conversion to open cholecystectomy.
- 3) To assess conversion of laparoscopic cholecystectomy to open cholecystectomy and reasons for same.

2. Methodology

This study has been carried out during the period of February 2015 to November 2016 at our institute. In this study, a total of 122 patients of symptomatic cholelithiasis who had undergone laparoscopic or open cholecystectomy or laparoscopic cholecystectomy converted to open cholecystectomy were studied.

The patients having choledocholithiasis were excluded from study. The following date makes an attempt to summarize the details of observations noted during the study

3. Result and Discussion

1. Age

The mean age incidence in our study was 41.5 years which compares well with the other studies. Various factors like shorter life span, racial, socioeconomic and dietary pattern have been implicated by Indian authors to account for younger age of presentation in India.

Sr. No.	Study	Mean age
1.	Hussain A et al 2008 ²⁰	43.96 years
2.	Palanivelu C et al 2007 ¹⁵	40.4 years
3.	Malhotra et al 1968 ¹⁶	39 years
4.	Sumitroj singh et al 2015 ²⁸	39.47 years
5.	Present study	41.5 Years

2. Sex

In our study, 22 patients were male and 100 patients were females. Females outnumber male in all age groups in present study. The male: female ratio in this study is **1:4.5** which compares well with the study of studies of Kama et al

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(1:4)²², Wani et al 1995 (1:4.40)¹⁷ and Shyamal et al 1995 (1:5.97)¹⁸. The ratio in our study is much higher than that of Malhotra et al 1968 (1:2)¹⁶, Kimura et al 1936 4 (1:1.52)²¹, Ganey et al 1986 (1:2.26)⁸ and Leon Morgenstrn et al 1992 (1:1.5)¹⁹.

3. Symptomatology And Clinical Signs In Present Series

In our study, pain in abdomen was present in 98% of patients which is comparable to 93% in the series on Ananth Krishnan et al (1976)²⁴ and 94.9% in the series of Wani et al (1995)¹⁷.

The most common site of pain was right hypochondrium well in comparison with Wani et al (1995)¹⁷ who reported pain in right hypochondrium in 94.9% cases.

4. Different Presentations Of Cholelithiasis

With the cases of choledocholithiasis being excluded from our study, the most common presentation was chronic calculous cholecystitis accounting for 81.15 % whereas acute on chronic cholecystitis accounted for 10.65 %. Similar incidence was noted by Ganey et al (1986) 79%⁸.

5. Surgical Procedure Done: (Rate Of Conversion)

In our study out of 122 patients, 120 patients had undergone laparoscopic cholecystectomy, 9 cases required conversion to open cholecystectomy. Conversion rate in our study was 7.5 % which is lower compared to other studies of Avinash Supe at al (2005) (11.4%)¹¹, Peters JH et al (1994) (14%)¹², Kumar A et al (1996) (14.3%)²⁵. It is however, comparable with Rashid et al (2016)³¹ (7%), Shamiyeh A et al (2007) (5.4%)¹⁸.

6. Operative Time

In our study, mean operative time required for laparoscopic cholecystectomy is **107.5** minutes (range: 60-145 min), while mean operative time required for laparoscopic converted to open procedures was **157.22** minutes (range:130-180 min), which was much higher compared with the series of Porte RJ et al (1996)²⁶ who conducted a study of over 200 patients and found the mean operating time for laparoscopic cholecystectomy to be 75 minutes (range: 40-140 minutes), and that of Sciume C et al (2005)²⁷ being 65.03 minutes (range: 30-180 minutes)

7. Reasons for conversion to open cholecystectomy

In our study out of 122 patients; 120 patients had undergone laparoscopic cholecystectomy, 9 (7.5%) cases required conversion to open cholecystectomy, and the reasons for conversion were as follows

Table 16: Reasons for Conversion

Reasons	Strasberg SM et al (1992) ⁵	Avinash Supe et al (2005) ¹¹	Le et al (2012) ³⁰	Present study
Adhesions/ chronic inflammation	50 (35.46%)	-	28%	4 (44.44%)
Acute inflammation	18 (12.76%)	-	35%	1 (11.11%)
Aberant anatomy	12(8.5%)	8(66.6%)	22%	1 (11.11%)
Bleeding	12(8.5%)	3(25%)	10%	2 (22.22%)
Biliary tract injury	12(8.5%)	1(8%)	5%	1 (11.11%)
Pyocholecystitis	7(4.9%)	-	-	-
Choledocholithiasis	7(4.9%)	-	-	-

Device failure/ mechanical problems	6(4.25%)	-	-	-
Cancer gall bladder	6(4.25%)	-	-	-
Bowel injury	5(3.5%)	-	-	-
Torn gall bladder	3(2.12%)	-	-	-
Bile leak	1(0.7%)	-	-	-
Choledochal cyst	1(0.7%)	-	-	-
Calculi spillage	1(0.7%)	-	-	-
Conversion rate	4.5%	11.4%	2.6%	7.5%

8. Relationship between moderate bleeding with gall bladder (GB) wall thickness and previous acute cholecystitis (AC) or pancreatitis (AP)

In our study, there is significant association between moderate bleeding and (GB) gall bladder wall thickness > 3 mm and previous acute cholecystitis or pancreatitis (p value <0.05).

Increased gall bladder wall thickness on preoperative ultrasonography represents the present inflammation or fibrosis due to previous attacks of Cholecystitis^{9,10}.

Sr. No.	Parameter	"p" value	Result
1.	GB wall thickness >3mm	0.00000008	Significant
2.	Previous AC or AP	0.0004	Significant

GB=gall bladder, AC= acute cholecystitis, AP=acute pancreatitis.

9. Relationship between gall bladder stone size >1 cm with difficulty in extraction

In our study there is significant association between Gall bladder stone size >1 cm and difficulty in extraction (p value <0.05). This correlates well with the study of Avinash Supe et al (2005)¹¹.

10. Relationship between gb wall thickness & conversion of LC:

In our study a gallbladder wall thickness of more than 3 mm was significantly associated with difficult surgical operation leading to conversion and with the histo-pathological report of chronic or acute inflammation (p value <0.05).

Nikhil Gupta et al (2013)²⁹ found gall bladder wall thickness of >4 mm on ultrasonography as one of the important factors predicting conversion along with other factors like past history of acute cholecystitis and clinically palpable gallbladder.

Avinash Supe et al (2005)¹¹ inferred that preoperative predictive factors significantly associated with conversion to open cholecystectomy are: obesity, patient gender, past history of acute cholecystitis or acute pancreatitis, past history of upper abdominal surgery, and gall bladder wall thickness >3mm.

Sikora et al (1995)⁶ found USG finding of contracted gall bladder or thickened gall bladder wall as important predictor of conversion along with male sex and palpable gall bladder lump.

Daradkeh S S et al (1998)⁷ found gall bladder wall and common bile duct diameter in preoperative USG as

significant predictors of technical difficulties during laparoscopic cholecystectomy.

NA Kama et al (2001)²², B J Ammori et al (2001)¹³ found following factors as significant predictors of conversion: male sex, past history of upper abdominal surgery, thickened gall bladder wall (>4mm), age>60 years, clinical diagnosis of acute cholecystitis or previous attacks of acute cholecystitis.

11. Relationship between male sex and conversion

In our study, we found no significant association of male sex with conversion to open cholecystectomy (p value < 0.05). This finding is in contrast with the following studies:

Brodsky et al ⁴, Liu et al (2001)⁹ identified age > 60 years, male gender & obesity as being preoperative factors associated with conversion.

Avinash Supe et al (2005)¹¹ found significant association between male sex, obesity, past history of acute cholecystitis or acute pancreatitis, past history of upper abdominal surgery and gall bladder wall thickness > 3 mm.

B J Ammori et al¹³, N A Kama et al (2001)²² also found male gender as independent risk factors for conversion. The reason of higher conversion rates in males remain unexplained in literature, but male sex is accepted as significant risk factor in most series²².

12. Relationship between obesity and conversion

In our study, we found significant association between obesity (BMI ≥ 30 kg/m²) and conversion of laparoscopic cholecystectomy (p value <0.05).

B J Ammori, M Larvin et al¹³ inferred obesity as a significant predictor of duration of surgery. Nachani et al(2012), Hussain et al(2014)²⁰, Liu et al (2001)⁹, Micheal Rosen et al (2002)¹⁴ also found obesity as an independent predictor of conversion.

13. Relationship between past history of acute cholecystitis or pancreatitis and conversion

In our study, we found significant association between past history of acute cholecystitis or pancreatitis and conversion (p value <0.05).

Sumitroj singh et al(2015)²⁸ found past history of acute cholecystitis as an important and independent predictor of conversion along with other factors like clinically palpable gallbladder, impacted gallstones, peri-cholecystic collection on ultrasound and upper abdominal scar of previous surgery.

N. A. Kama et al (2001)²², Avinash Supe et al (2005)¹¹ found past history of acute cholecystitis as one of the important factors predicting conversion with other factors like male sex, obesity, past history of upper abdominal surgery and gall bladder wall thickness >3 mm.

14. Relationship of conversion to open cholecystectomy with various parameters on univariate analysis:

Sr. No.	Parameter		“p” value	Result
1.	Past history of acute cholecystitis or pancreatitis	Chi-Square test applied	0.025	Significant
2.	Gall bladder wall thickness > 3mm		0.00002	Significant
3.	Obesity		0.0001	Significant

Thus, previous attacks of cholecystitis or pancreatitis, gall bladder wall thickness >3 mm and obesity (BMI ≥30 kg/m²) are found to be significant predictors of conversion of laparoscopic cholecystectomy to open cholecystectomy.

4. Conclusion

Cholelithiasis is one of the most common diseases affecting mankind. Today, laparoscopic cholecystectomy is the gold standard care for the treatment of symptomatic gall bladder disease^{18, 20}. By proper pre-operative assessment of the patient using clinical and sonological parameters, surgeon can impart the best possible outcome to the patient. Thus, we conclude as follows:

- 1) Clinical factors like previous acute cholecystitis or pancreatitis, obesity are significant risk factors of conversion. These factors can be helpful to predict difficult laparoscopic cholecystectomy and likelihood of conversion of laparoscopic cholecystectomy.
- 2) Ultrasonographic findings of gall bladder wall thickness > 3mm is a significant factor of conversion and it is also associated with other factors like adhesions, mass formation and local infection. Hence, it may be helpful in prediction of difficult laparoscopic cholecystectomy and conversion to open cholecystectomy.
- 3) Patients with high predicted risk of conversion could be operated on either by or under supervision of more experienced surgeon.
- 4) In patients with high predicted risk of conversion surgeon may take early decision to convert to open cholecystectomy or surgeon may directly go for open cholecystectomy; this may shorten the duration of surgery and associated morbidity.
- 5) With proper preoperative assessment of clinical and sonographic parameters the best possible results can be imparted to the patient undergoing laparoscopic cholecystectomy.
- 6) Thus we can infer that conversion is neither a failure nor a complication but it is an attempt to minimize the complications.

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