

A Prospective Analysis of Preoperative Prediction of Difficult Laparoscopic Cholecystectomy

Manjit Tanwar¹, Ramendranath Talukdar^{1*}, Uma Pradhan², Ravi Kumar², Kushal Choksi²

¹M.B.B.S, MS, General Surgery, SGT University, Chandu- Budhera, Haryana, India

²M.B.B.S, Post- Graduate student, General Surgery, SGT University, Chandu- Budhera, Haryana, India

DOI: [10.36347/sajs.2021.v07i07.010](https://doi.org/10.36347/sajs.2021.v07i07.010)

| Received: 06.06.2021 | Accepted: 03.07.2021 | Published: 30.07.2021

*Corresponding author: Dr. Ramendranath Talukdar

Abstract

Original Research Article

Purpose: To study the problems faced during laparoscopic cholecystectomy such as: accessing the peritoneal cavity, creating pneumo-peritoneum, dissecting the gallbladder, extracting the gallbladder and conversion from laparoscopic cholecystectomy to open cholecystectomy. **Method:** Two hundred consecutive patients of chronic cholecystitis with cholelithiasis, who underwent laparoscopic cholecystectomy at Shree Guru Gobind Singh Tricentenary Medical College, Hospital and Research Institute, from January 2019 - December 2020; were included in this study. **Results:** A total of 200 patients underwent elective cholecystectomy. Majority of who were females (85%). Out of which, in 41 (20.5%) patients, access to peritoneal cavity was difficult and in 34.5% patients; difficulty occurred during gallbladder dissection. In the present study conversion rate from laparoscopic to open cholecystectomy was 4% and mortality was 0%. **Conclusion:** It can be concluded from our study that male gender, BMI >30kg/m², previous abdominal surgery, contracted or distended gallbladder and gallbladder with wall thickness >3mm are the preoperative factors that can predict the difficulty in performing laparoscopic cholecystectomy.

Keywords: Laparoscopic Cholecystectomy, Conversion, Difficult Laparoscopic Cholecystectomy.

Copyright © 2021 The Author(s): This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International License (CC BY-NC 4.0) which permits unrestricted use, distribution, and reproduction in any medium for non-commercial use provided the original author and source are credited.

INTRODUCTION

Gallstones are a major cause of morbidity and mortality throughout the world [1]. At least 10% adults have gallstones [2, 3]. Gall stones are remarkably common and an expensive health problem. Its prevalence has become more apparent since the introduction of ultrasound (USG) and is estimated to be 2% to 29% in India [4, 5]. This disease is seven times more common in North India (stone belt) than in South India [6].

Laparoscopic Cholecystectomy is safe and effective procedure due to shorter hospital stay, more rapid convalescence, less immunosuppression, smaller catabolic response and imposes fewer burdens on the state exchequer. In Open Cholecystectomy, 10-12cm long abdominal incision is required; whereas in Laparoscopic Cholecystectomy only 3 or 4 small incisions of 5-10mm each are required. Pain is negligible in comparison to that of a long incision done during open procedures. The miniature incision also reduces the incidence of post-operative complications like infection, incisional hernia and provides excellent cosmetic results. The mortality rate in Laparoscopic

Cholecystectomy when compared to Open Cholecystectomy is 0.04% vs. 0.4% and overall complication rate is 9% vs. 16% [7]. Conversion to Open Cholecystectomy is required in 2% to 15% of patients undergoing Laparoscopic Cholecystectomy [8].

The conversion rate remained high (28.5%) in the presence of acute cholecystitis. Despite of increased experience and conversion was required in only 3.4% of the patients with non-acute symptoms. Dense adhesions, edematous and friable gallbladder were the main causes of high conversion rates in those cases. Another problem interfering with good exposure was dense and highly vascular adhesions in these areas. Manipulation often causes bleeding, and visualization may be further hampered [8].

For Laparoscopic Cholecystectomy we need to formulate some guidelines to prevent these complications by rectifying/ identifying these predicting factors. So that we can reduce the morbidity and mortality associated with this procedure and make Laparoscopic Cholecystectomy a safer procedure.

Aim

To study the problems faced during Laparoscopic Cholecystectomy such as accessing the peritoneal cavity, creating pneumo-peritoneum, dissecting the gallbladder, extraction of the gall bladder and conversion from laparoscopic cholecystectomy to open cholecystectomy. To evaluate the role of factors like old age, male gender, obesity, previous upper abdominal surgery and ultra-sonographic findings in predicting the difficulty during Laparoscopic Cholecystectomy and chances of conversion from Laparoscopic Cholecystectomy to Open Cholecystectomy.

METHODOLOGY

Two hundred consecutive patients of Chronic Cholecystitis with Cholelithiasis, who underwent Laparoscopic Cholecystectomy in SGT Medical College and Hospital, Gurugram, located in North India from January 2019 to December 2020, were included in this study. The same experienced Laparoscopic Surgeons who supervised this study, operated upon all the cases included in this study.

EXCLUSION CRITERIA

- Patients with suspected Common Bile Duct (CBD) stones or dilated CBD on USG
- Patient having clinical or USG suspected diagnosis of Gallbladder Carcinoma.

- Age below 16 years.
- Pregnancy and lactation
- Acute Cholecystitis
- Acute Pancreatitis

STATISTICAL ANALYSIS

Statistical analysis was performed using Chi-Square test to determine that, whether the factors are associated with difficulty in performing Laparoscopic Cholecystectomy or not, and odds ratio (OR) and their 95% Confidence Interval (CI) was calculated using SPSS software. Next, a correlation matrix was developed to evaluate correlation between individual predictors. Conclusion regarding the role of various factors in predicting the difficulty of Laparoscopic Cholecystectomy and conversion from Laparoscopic Cholecystectomy to Open Cholecystectomy was drawn.

RESULT

In our study, a total of 200 patients underwent elective Laparoscopic Cholecystectomy, majority of the patients were female (85%) and male were only 15%. Most of female patients were in the age group of 31-40 years (25.5%) followed by 17.5% in age group of 41-50 years. The number of patients <65 years were 182 (91%) and >65 years were 18 (9%). In this study, most of our patients were overweight (59.5%), 17.0% were obese and 0.5% were morbidly obese. Mean Body Mass Index (BMI) was 27.50006 with SD \pm 3.828946.

Table-1: BMI of Patients

BMI	Number Of patients	Percentage (%)
Normal <25	46	23.0
Overweight (25-29.9)	119	59.5
Obese (30-39.9)	34	17.0
Morbid obesity >40	1	0.5
Total	200	100.0

In the present study majority of patients presented with symptoms of pain in right upper abdomen (95%), dyspepsia (95%) and vomiting (14%). No patient had fever at the time of presentation. All patients had chronic symptoms. There were 63 (31.5%)

patients with history of previous lower abdominal surgery, majority of these patients were females on whom gynecological and obstetrical procedures were performed on the lower abdomen.

Table-02: Segregation of Patients on basis of history of previous surgeries

Sr. No.	History of Previous abdominal surgery	Number of patients	Percentage
1	No abdominal surgery	137	68.5
2	Lower abdominal surgery	63	31.5
3	Upper abdominal surgery	Nil	Nil
	TOTAL	200	100.0

Among the patients, 41(20.5%) patients had contracted gallbladder whereas 15(7.5%) had distended gallbladder and remaining 144(72%) had normal distention. The gallbladder wall thickness in 164(82%) patients was <3mm and in 36(18%) patients it was >3mm. In 161(80.5%) patients; there were multiple

stones on USG whereas in 39(19.5%) patients a single stone was visualized on USG. About 72.5% patients had stone size <1cm and 27.5% had it >1cm. Overall 16 (8%) patients had stones impacted in the Hartmann's pouch.

Table-03: Ultrasound Findings

Sr. No.	USG findings	No. of patients	Percentage (%)		
1	Gallbladder distention	Contracted	41	20.5	
		Distended	15	7.5	
		Normal	144	72.0	
2	Gallbladder wall thickness	<3mm	164	82.0	
		>3mm	36	18.0	
3	USG Murphy's Sign	Present	NIL	NIL	
		Not present	200	100	
4	Pericholecystic fluid	Present	NIL	NIL	
		Not present	200	100	
5	Stone	Multiple	161	80.5	
		Single	39	19.5	
		Size of the largest stone	<1cm	145	72.5
			>1cm	55	27.5
		Impacted stone at Hartmann's pouch	No	184	92.0
Yes	16		8.0		

The mean operative time was 34.58 minutes, with range being 15-150 minutes. About, 27 (13.5%) patients were operated in less than 20 minutes time, in 58% of patients the operating time was around 21-40 minutes time and in 7 patients operative time exceeded

60 minutes. In 41(20.5%) patients there was difficulty in accessing the peritoneal cavity. In our study closed method for creating pneumoperitoneum was used for all patients.

Table-04: Difficulty in Accessing Peritoneal Cavity

Access to peritoneal cavity	No. Of patients	Percentage
Difficult	41	20.5
Easy	159	79.5
Total	200	100.0

There was no injury due to Veress needle or Trocar to the any major vessel. Cystic artery injury occurred in two cases. In one bleeding was controlled by using diathermy, while in other case surgery was

converted to open as bleeding didn't stop by pressure or diathermy. Omentum was the one of the most common sites of moderate bleeding.

Table-05: Extent of Bleeding

BLEEDING	NO OF PATIENTS	PERCENTAGE
MINIMAL	185	92.5
MODERATE	15	7.5
TOTAL	200	100.0

Difficulties in gallbladder dissection occurred in 69(34.5%) patients, which included difficulty in grasping, difficulty in gallbladder retraction, difficulties due to obliterated anatomy of Calot's triangle,

difficulties due to adhesions, difficulties due to embedded gallbladder on liver and difficulties due to anatomical variation.

Table-06: Difficulty in Dissection

Dissection of gall bladder	No. of patients	Percentage
Difficult	69	34.5
Easy	131	65.5
Total	200	100.0

In present study conversion rate was 4% with 0% mortality rate.

Table-7: Laparoscopic to Open Conversions

Conversion	No of patients	Percentage
No	192	96.0
Yes	8	4.0
Total	200	100.0

DISCUSSION

Cholecystectomy is procedure of choice for symptomatic gallstones. It is the commonest operations of the biliary tract and second most common operative procedure performed today. The first successful Open Cholecystectomy for Gallbladder stones was performed by Carl Johann August Langenbuch in Berlin on 15th July 1882 [9].

The first Laparoscopic Cholecystectomy was performed by Erich Mühe in 1985 [10]. However, the first Laparoscopic Cholecystectomy recorded in medical literature was performed in March 1987 by Philippe Mauret in Lyon, France [11]. In India T.E. Udwadia performed the first Laparoscopic Cholecystectomy in 1989 at J.J. Hospital, Bombay [12].

Laparoscopic Cholecystectomy may be rendered difficult because of various problems encountered during surgery such as: difficulties in accessing the peritoneal cavity, creating a pneumo-peritoneum, increased chances of bleeding, dissection of gallbladder, spillage of bile, spillage of stone and difficulty in gallbladder extraction, which may require conversion to Open Cholecystectomy. These may be due to acute inflammation, aberrant anatomy, adhesions, unexpected intra-operative abnormal findings, iatrogenic injuries, obesity, a need for ductal exploration, and equipment failure.

We aimed to determine per-operative risk factors that can be used to predict a “Difficult Cholecystectomy” and the risk of per-operative complications to optimize peri-operative management. Also, such predictions may allow a surgeon to be better prepared, take extra precautions to reduce intra-operative complications and readiness to convert from Laparoscopic Cholecystectomy to Open Cholecystectomy at an earlier stage. In the present study the mean age of patients who underwent Laparoscopic Cholecystectomy was 43.21 years showing that Cholelithiasis is more common in the age group of forty plus, majority of patients were female (85%) and male were only 15% showing that females are more prone of gallstone disease than males. Most of our patients (59.5%) were overweight, 17.0% were obese and 0.5% was morbidly obese. The mean BMI was 27.50006, suggesting Cholelithiasis to be a disease prevalent in fatty persons. In this study difficulty in accessing the peritoneal cavity was encountered significantly more often in obese patients ($p < 0.001$).

In present study previous abdominal surgery was found to be associated with difficult access to peritoneal due to adhesions. Supra-umbilical position was preferred if infra-umbilical scar of previous surgery was present. In patients with an old scar up to umbilicus we used left palmer’s point space for creating pneumo-peritoneum followed by first trocar insertion at the same incision. The thickened wall of the gallbladder, measured pre-operatively by ultrasound, is regarded by some as a risk factor for conversion. Difficulty in peeling off gallbladder from the liver bed was assessed in terms of bleeding and bile leak from the gallbladder due to perforation. This was compared to the gallbladder wall thickness that was described in USG report. Bleeding was significant in cases with >3 mm wall thickness. Wall Echo Shadow (WES) sign was significantly associated with difficulty in dissection of gall bladder. WES sign is a specific sign of contracted gallbladder with stone. WES sign was associated with difficulty in grasping gall bladder which led to difficulty during dissection of gallbladder.

At the same time distended gallbladder also had difficult dissection because of unclear Calot’s Triangle anatomy (p value being < 0.001). Gallbladder extraction was significantly associated with size of stone >10 mm, extension of the incision was required in 9.5% patients in whom the size of largest stone >10 mm ($p < 0.001$). It was also required when stone was impacted stone at Hartman pouch ($p < 0.001$). In 53.5% of the patients, Laparoscopic Cholecystectomy was difficult. In our study 41 patients had difficulties during access to peritoneal cavity.

We found in our study that 80% of patients with restricted flow can be improved with simple methods like lifting anterior abdominal wall. This was supported by Roy and Bazzurini [13], who, in their study revealed that increased abdominal thickness decreases the distance between parietal peritoneum and viscera. T W Hilgers [14] also supported these findings. Difficulty can occur in lifting the abdominal wall, creating pneumo-peritoneum, or in the form of injury due to Veress needle or Trocar insertion. Minimal amount of bleeding occurs in Laparoscopic Cholecystectomy. Moderate bleeding during surgery occurred in 15(7.5%) patients and none had severe bleeding. Most common site for bleeding was Omentum, then port followed by gallbladder port. In present study 34.5% patients had difficulty in Gallbladder dissection in the from grasping Gallbladder, difficulty in retracting Gallbladder, difficulty due to obliterated anatomy of Calot’s triangle, difficulty due to adhesions, difficulty due to embedded Gallbladder in liver, difficulty due to anatomical variation. The mean operative time was 34.58 minutes, with range being 15-150 minutes. Since its introduction almost 35 years ago, Laparoscopic Cholecystectomy has been considered a mature and safe operation. The

Operative time is reduced as the learning curve is overcome.

SUMMARY & CONCLUSION

We conclude from our study that male gender, BMI >30kg/m², previous abdominal surgery, contracted gall bladder, distended gall bladder, gall bladder walls thickness >3 mm, WES sign positive, size of the largest stone >10mm and impacted stone at Hartmann's pouch are factors which can pre-operatively predict the difficulty in Laparoscopic Cholecystectomy in elective cases. There should be no hesitation to convert to open if anatomy is unclear or dense adhesions are present. "Time to convert is before a complication occurs, and not after it". Conversion to open reflects sound surgical judgment. Pre-operative prediction of a difficulty in cholecystectomy and the risk of conversion are of great help both to the patient and the doctor. A patient can get mentally prepared for the outcomes and the surgeon can also schedule his time and team accordingly.

Finally, it is concluded that the major complications in elective Laparoscopic Cholecystectomy are preventable by proper selection of patients, strictly following the basic principles of Laparoscopic Cholecystectomy and keeping low threshold to convert when anatomy is unclear.

REFERENCES

1. Johnston, D. E., & Kaplan, M. M. (1993). Pathogenesis and treatment of gallstones. *New England Journal of Medicine*, 328(6), 412-421.
2. Diehl, A. K. (1991). Epidemiology and natural history of gallstone disease. *Gastroenterology Clinics of North America*, 20(1), 1-19.
3. Heaton, K. W., Braddon, F. E., Mountford, R. A., Hughes, A. O., & Emmett, P. M. (1991). Symptomatic and silent gall stones in the community. *Gut*, 32(3), 316-320.
4. Prakash, A. (1968). Chronic cholecystitis and cholelithiasis in India. *Int Surg*, 49(7), 85.
5. Khuroo, M. S., Mahajan, R., Zargar, S. A., Javid, G., & Sapru, S. (1989). Prevalence of biliary tract disease in India: a sonographic study in adult population in Kashmir. *Gut*, 30(2), 201-205.
6. Jayanthi, V., Palanivelu, C., Prasanthi, R., Mathew, S., & Srinivasan, V. (1998). Composition of gallstones in Coimbatore District of Tamil Nadu State. *Indian journal of gastroenterology: official journal of the Indian Society of Gastroenterology*, 17(4), 134-135.
7. Deziel, D. J., Millikan, K. W., Economou, S. G., Doolas, A., Ko, S. T., & Airan, M. C. (1993). Complications of laparoscopic cholecystectomy: a national survey of 4,292 hospitals and an analysis of 77,604 cases. *The American journal of surgery*, 165(1), 9-14.
8. Alponat, A., Kum, C. K., Koh, B. C., Rajnakova, A., & Goh, P. M. (1997). Predictive factors for conversion of laparoscopic cholecystectomy. *World journal of surgery*, 21(6), 629-633.
9. Beal, J.M. (1984). Historical perspective of gall stone disease. *Surg Gynecol Obstet*, 158:81.
10. Mühe, C. (1986). Cholezystektomie durch das Laparoskop. *Langenbecks Arch Klein Chir*, 369:804.
11. Mouret, P. H. (1991). From the first laparoscopic cholecystectomy to the frontiers of laparoscopic surgery: the future prospectives. *Digestive surgery*, 8(2), 124-125.
12. Udwadia, T.E. (1991). *Laparoscopic cholecystectomy*. First ed. Bombay; Oxford University press, 65-78, 84-87.
13. Roy, G. M., Bazzurini, L., Solima, E., & Luciano, A. A. (2001). Safe technique for laparoscopic entry into the abdominal cavity. *The Journal of the American Association of Gynecologic Laparoscopists*, 8(4), 519-528.
14. HILGERS, T. W. (1992). A simple, safe technique for placement of the veress needle and trocar in laparoscopy. *Journal of laparoendoscopic surgery*, 2(4), 189-192.