

Laparoscopic Cholecystectomy: Surgical Experience of a Single Unit at a Tertiary Care Centre

Jyoti S, Farhanul H*, Julie S, Shashank K, Joshua LM and Sudhir KS

Department of General Surgery, AIIMS Rishikesh, India

*Corresponding author: Farhanul Huda, Department of General Surgery, AIIMS Rishikesh, India, Tel: +919997533211; Email: farhanul193huda@gmail.com

Research Article

Volume 3 Issue 3

Received Date: June 03, 2019

Published Date: June 25, 2019

DOI: 10.23880/mjccs-16000228

Abstract

Introduction: Laparoscopic cholecystectomy (LC) is the gold standard for the management of benign gall stone disease and is the most commonly done surgery worldwide. In this study, we share our experience of laparoscopic cholecystectomies done in a single unit at our tertiary care centre and elaborate the difficulties and complications faced in order to find a correlation between the pre and intra operative variables and the degree of difficulty of surgery.

Methods: All elective laparoscopic cholecystectomies done for benign gall stone disease in a single unit at Department of General Surgery at our tertiary care hospital from Jan 2018 till December 2018 were evaluated and the pre-operative and intra operative variables were assessed and compared.

Results: A total of 70 patients were evaluated out of which 57 were females. We saw that Body Mass Index (BMI), impaction of stone at Gall bladder (GB) neck and cystic artery bleed were significant factors for increased duration of surgery and intra operative complications while factors such as aberrant anatomy and male gender were not significant in our study.

Discussion: There is no level 1 evidence showing correlation between the pre and intra operative variables and their association with difficult LC. So we need to explore this area more and find strong evidences so that we could predict in which patient's laparoscopic cholecystectomy is going to be difficult so that the surgeon may be prepared accordingly.

Keywords: Laparoscopic Cholecystectomy; Experience; Difficult LC

Abbreviations: LC: Laparoscopic Cholecystectomy; BMI: Body Mass Index; GB: Gall Bladder; OC: Open Cholecystectomy; CBD: Common Bile Duct; POD: Post-Operative Day.

Introduction

Gall stone disease is by far the most common disease of the gall bladder and the biliary tree and Laparoscopic

Cholecystectomy (LC) has been recognized as the gold standard for the treatment of benign gallstone diseases. It is also one of the most commonly done surgeries worldwide [1].

The advantages of laparoscopic over open cholecystectomy (OC) have been well documented and include earlier return of bowel function, lesser postoperative pain, improved cosmesis due to smaller scars, shorter length of hospital stay, earlier return to full

activity, and decreased overall cost [2]. However, sometimes due to dense adhesions and aberrant anatomy at the Calot's triangle, the surgeon may face some difficulty while dissection leading to increased duration of surgery, increased chances of injury to surrounding structures, bile and stone spillage and increased chances of conversion to open surgery. These factors collectively constitute a difficult laparoscopic cholecystectomy and pose a challenge to the surgical skills of a surgeon.

But with the increasing experience of the surgeon, better understanding of the aforementioned technique and improved technology, there has been a dramatic decrease in the rates of conversion from laparoscopic to open cholecystectomy from 0%-22% to approximately 1%-5% [3]. However, despite that, conversion to open cholecystectomy remains a major and important problem for surgeons.

In this study, we share our experience of laparoscopic cholecystectomies that were done within the last 1 year by a single surgeon in a single unit at a tertiary care.

Body of the Paper

Aims and objectives

- a) To evaluate the pre-operative variables in patients undergoing elective laparoscopic cholecystectomy.
- b) To evaluate the difficulties and per operative complications encountered during LC.
- c) To find the correlation of some of the pre-operative and intra operative variables with the difficulty of surgery.
- d) To find the correlation of the perioperative variables with the intra and post-operative complications and the post-operative length of stay.

Materials and Methodology

It was a prospective observational study done at a tertiary care centre in Department of General Surgery in a single unit. All elective laparoscopic cholecystectomies done from January 2018 till December 2018 were included for evaluation. All LCs were done by a single surgeon with a formal training in laparoscopic surgery.

A total of 70 patients who underwent elective LC during this study were reviewed prospectively after obtaining a written informed consent from the patients.

Inclusion Criteria

Patients of both sexes of 18 or above age group with benign gall stone disease undergoing elective laparoscopic cholecystectomy were included.

Exclusion Criteria

- a) Patients with any contra indication to laparoscopic surgery.
- b) Patients with concurrent choledocholithiasis.
- c) Patients opting for open surgery.
- d) Patients with acute cholecystitis.
- e) Patients with associated ventral hernias.
- f) Patients with gall bladder malignancy.
- g) Emergency LCs.
- h) Patients who required intra operative cholangiogram during LC.

The patient's demographic data, clinical and radiological data, co morbid conditions, intra operative findings and complications were recorded and entered in a pre-structured Proforma. The diagnosis of cholelithiasis was confirmed on ultrasonography and the status of liver, Gall Bladder (GB) like over distended or contracted GB, GB wall thickness, number of stones, pericholecystic fluid, any evidence of acute cholecystitis and status of Common Bile Duct (CBD) was noted.

Laparoscopic Cholecystectomy was done under General Anaesthesia using the conventional American 4 port technique on a 4K HD system. Pneumoperitoneum was created by closed technique and the intra-abdominal pressure was kept between 12-14 mm of Hg. Operative steps included dissection at the Calot's triangle and the cystic duct and artery were dissected, delineated and clipped. GB was dissected from the liver bed and extracted via laparoscopic GB extractor through the epigastric port in all cases.

Mean duration of the surgery was recorded from the time of incision at the umbilicus for the umbilical port till skin closure of the last port. The patients were allowed orally 6 hours post-surgery and discharged on the next day and asked to follow up next week for suture or staple removal.

Statistical Analysis

The IBM SPSS statistics program was used for statistical analysis. Data were reported as frequency and ratio and Pearson's Chi square test and Fischer's exact

test were used. The confidence interval was kept at 95% and the level of significance was accepted as p value of <0.05.

Results

A total of 70 patients who underwent elective LC were evaluated over the course of 1 year starting from January 2018 till December 2018 out of which 57 were females and 13 were males. Mean age of the patients was 40 years (40.29 years), the youngest being a 19 years old female and the oldest being a 75 years female (Table 1).

S. No	Variables	N (70)
1.	Age >40 years	30 (42.8%) (Mean: 40.29; S.D. 11.89)
2.	Gender: Males Females	13 (18.6%) 57 (81.4%)

Table 1: Age and sex distribution.

6 of the patients in the study had associated co morbidities like Diabetes, hypertension (HTN) or hypothyroidism and 31 patients had a BMI of >25 kg/m² (Table 2).

S. No	Variables	N (70)
1.	DM	6 (8.5%)
2.	HTN	5 (7.1%)
3.	Hypothyroidism	1 (1.4%)
4.	BMI >25 kg/m ²	31 (44.2%)

Table 2: Comorbid conditions.

Out of 70 patients, none of the males had undergone previous surgery while 5 females gave a history of open abdominal hysterectomy, 10 of them had undergone LSCS, 4 cases had laparoscopic tubal ligation and one case had undergone right nephrectomy in view of non-functioning kidney (Table 3).

S. No	Variables	N (70)
1.	Open abdominal hysterectomy	5 (7.1%)
2.	LSCS	10 (14.2%)
3.	Laparoscopic tubal ligation	4 (5.7%)
4.	Right nephrectomy	1 (1.4%)

Table 3: History of previous surgery.

Around 26 patients gave a history of recent attack of severe pain suggesting acute cholecystitis within the last 2 weeks (Table 4).

S. No	Variables	N (70)
1.	<2 weeks	26 (37.1%)
2.	>2 weeks	45 (64.2%)

Table 4: Last episode of severe pain.

Ultrasonographic findings included presence of a single calculus which was seen in 30 cases, increased GB wall thickness seen in 3 cases, impaction of stone at the neck of GB in 14 cases and dilated CBD in 2 cases which was found to be of normal caliber intraoperative in all cases (Table 5).

S. No	Variables	N (70)
1.	Single stone	30 (42.8%)
2.	Increased GB wall thickness	3 (4.2%)
3.	Impaction of stone at neck of gall bladder	14 (20%)
4.	Peri cholecystic fluid	None
5.	Dilated CBD	2 (2.8%)

Table 5: Sonographic findings.

Prophylactic antibiotic coverage was given by a first or a second generation cephalosporin, 1 hour before the skin incision. The camera port was inserted, in around 66 cases, via a supra umbilical incision while 4 cases were done by infraumbilical incision owing to the presence of scar of laparoscopic tubal ligation. Pneumoperitoneum was created by closed technique via Veres' needle in all cases.

The routine steps were dissection at the Calot's triangle, delineation of cystic duct and artery and clipping and cutting them respectively, the duct being clipped and cut before the artery. Then, the gall bladder was separated from the liver bed by sharp dissection by a laparoscopic hook and taken out via the 10mm epigastric port in all cases.

Intra operatively, it was seen that around 20 cases showed dense adhesions at Calot's triangle which required meticulous dissection and thereby resulted in prolongation of the duration of surgery. The adhesions were cleared via sharp dissection at the Calot's triangle, with the main aim being visualizing the critical view of safety and avoiding injury to the cystic duct and the artery. However, in 7 cases, due to dense fibrous adhesions, there were instances of injury to the cystic artery resulting in bleeding which was controlled successfully.

Aberrant anatomy seen at the Calot's triangle were short and posteriorly placed cystic artery in 4 cases and the cystic duct traversing alongside the common hepatic duct before entering it in one case. One case saw an aberrant cystic artery arising from the common hepatic artery. The anatomy was delineated well before and no intra operative complications were seen. There were around 9 cases of mucocele and 2 cases of pyocele, all of them associated with dense adhesions at the Calot's triangle resulting in an over distended gall bladder and need for intra operative suctioning of gall bladder to prevent spillage (Table 6).

S. No	Variables	N (70)
1.	Camera port position: Supra umbilical Infraumbilical	66 (94.2%) 4(5.7%)
2.	Adhesions at Calot's triangle	20 (28.5%)
3.	Intra hepatic GB	4 (5.7%)
4.	Impaction of stone at neck	15 (21.4%)
5	Mucocele/Pyocele	9/2 (15.7%)
6.	Aberrant anatomy	6 (8.5%)
7.	Overdistended GB	12 (17.1%)
8.	Need for GB suctioning	12 (17.1%)

Table 6: Intra operative findings.

Routine use of antibiotics was not practiced at our institute as Laparoscopic cholecystectomy is a clean surgery. However, in cases of pus spillage from pyocele, a single shot of second generation cephalosporin was given. Only one case in the past 1 year was converted to open, the reason being a frozen Calot's triangle with concurrent co morbidities requiring shorter duration of surgery.

Bile and stone spillage were seen in 13 and 4 cases respectively during separation of GB form the liver bed which was managed by irrigation and suctioning of the

bile after extraction of GB and extraction of stone with laparoscopic ovum forceps respectively (Table 7).

S. No.	Variables	N (70)
1.	Stone spillage	4 (5.7%)
2.	Bile spillage	13 (18.5%)
3.	Cystic artery bleed	7 (10%)
4.	Conversion to open	1 (1.4%)
5.	Length of stay >1 day	4 (5.7%)

Table 7: Intra operative complications.

Routine use of drains was not practiced and was used only in one of the 70 cases where there was extensive dissection and bleeding from the liver bed. It was removed on post-operative day (POD) 2 and the patient was discharged sans drain the next day. The post-operative length of stay was 1 day, with the patients being discharged the next day. 4 cases had post-operative length of stay of more than 1 day, the reason being abdominal distension or severe pain. They were observed and managed conservatively and were discharged on POD2. The patients were followed up after 1 week for routine examination and removal of sutures/staples. We analyzed the correlation of some of the pre-operative and intra operative variables with the difficulty of surgery, intra and post-operative complications and the length of stay from the data we collected and tried to find an association between them. We also calculated the mean time of surgery which was around 40 minutes and the patients with duration of surgery of more than 60 minutes were considered as difficult LC as described by Randhawa and Pujahari and Hussein Atta [4,5].

Out of 70 samples in our study, 22 of them had duration of surgery of 60 or more than 60 minutes and the variables affecting were grouped under patient factors, sonographic findings and intra operative variables (Table 8).

S.no	Variables	No. affected (out of 22)	Percentage
Patient factors			
1.	Male sex	2	9%
2.	Age >40 years	12	54%
3.	BMI >30	2	9%
	>25	14	63%
4.	Co morbidities	4	18%
5.	Attack of acute cholecystitis within 2 weeks	8	36%
USG findings			
6.	No. of stones:		

	Single	12	54.5%
	Multiple	10	45.4%
7.	Increased GB thickness	1	4%
8.	Stone at neck of GB	11	50%
Intra operative variables			
9.	Adhesions	14	63%
10.	Intrahepatic Gall bladder	3	13.6%
11.	Mucocele/Pyocele	6/1	31.8%
12.	Short cystic duct	2	9%
13.	Aberrant anatomy	1	4%
14.	Cystic artery bleed	5	22.7%
15.	Bile spillage	6	27.2%
16.	Stone spillage	3	13.6%
17.	Post-operative complications	1	4%

Table 8: Evaluation of variables and difficult LC.

S.No	Variables	P value
1.	BMI	0.031
2.	Pain in last 2 weeks	0.659
3.	Aberrant anatomy	0.083
4.	Intrahepatic GB	0.033
5.	Overdistended GB	0.401
6.	Impaction of stone at GB neck	0.003
7.	Adhesions at Calot's triangle	0.464
8.	Dilated CBD	0.566
9.	CA bleed	0.016
10.	Mucocele/Pyocele	0.012
11.	Bile spillage	0.542
12.	Stone spillage	0.775

Table 9: p values of perioperative variables.

It was seen that BMI, impaction of stone at the GB neck and Cystic artery bleed were significant factors causing a difficult LC while aberrant anatomy, increased GB wall thickness, intra operative adhesions and even male gender which were said to be significant factors for a difficult LC were found to be not very significant in our study. Moreover, none of the variables showed significant effect on the post-operative length of stay.

Discussion

Laparoscopic cholecystectomy has become the standard of treatment for gall stone disease and results in earlier post-operative recovery and fewer GI complications [1,2]. However, there are many pre and intra operative factors that might result in a difficult LC. Randhawa and Pujahari formulated a scoring system

listing several pre and intra operative predictors, both clinical and sonological, for predicting a difficult LC. Abdulzahra Hussain also mentioned some predictors of difficult LC which are listed below [4,5]:

- Male sex
- Age
- Attack of Acute cholecystitis in recent times.
- Gall bladder wall thickness
- Obesity
- Upper abdominal surgery- adhesions
- Impaction of stone at the neck
- Short and wide cystic duct.
- Hepatomegaly.
- Mucocele/ pyocele
- Anatomic Variation

Obesity is associated with higher risk of complications during surgery leading to prolongation of duration of surgery, increased morbidity and higher chances of conversion to open cholecystectomy [4,6-8]. In our study, it was seen that out of 22 patients who had difficult LC, 14 (63%) of them had a BMI of >25kg/m² and were associated with increased duration of the surgery and higher chances of cystic artery injury which was seen in 2 cases. The main reasons were difficulty in creating pneumoperitoneum via Veres' needle, difficulty in manipulation of the laparoscopic instruments due to thickness of subcutaneous fat and difficult dissection at a fatty Calot's triangle [4,9]. However, our study saw no conversions to open in these patients. In contrast to our study, Simopaulos et al. showed no significance between obesity and difficult LC.

A study done by Hussein M Atta and Lal et al. showed that impaction of stone at the neck of GB (p 0.0001) had increased chances of undergoing a difficult LC which was reciprocated in our study [10,11]. 50% of the patients undergoing difficult LC had stone impacted at the GB neck and it was seen that it was a significant factor leading to difficult LC. This was mainly due to inflammation produced at the GB neck causing difficult dissection at Calot's triangle and difficulty in grasping the Hartmann's pouch to provide adequate traction in order to visualize the duct and the artery.

Many authors have reported that increasing age and male sex are known to be significant factors responsible for a difficult LC but our study suggested otherwise [9,12-14]. Reiterating the study done by Randhawa and Pujahari, we found that there was no significant effect of male gender on difficult LC [4]. Out of 70 patients in our study, 13 were males and out of these 13 males only 2(9%) had duration of surgery of more than 60 minutes. Both of them were discharged on POD1 without any complications.

As quoted by Pavlidis in his study, although LC is considered as a safe procedure in elderly, it is associated with a high morbidity and conversion rate [15]. But our study saw that increasing age was not a significant factor for causing a difficult LC and the results were similar to a study by Khetan [16]. In our study, we had 4 patients who were above 60 years of age; the oldest patient being a 75 years old female and all of them had an uneventful surgery and were discharged the next day. Cystic artery bleed (p 0.01) was seen in 7 patients out of 70 in our study out of which 5 had difficult LC. This was mainly due to adhesions at the Calot's triangle which obscured the anatomy of the duct and artery. However, intra operative adhesions (p0.464), as an independent variable were not very significant in causing a difficult LC. The same was seen with increased GB wall thickness (p 0.663) and aberrant anatomy at Calot's triangle (p 0.083). These variables showed insignificant results in our study as was seen in a study by Carmody et al. which was contrary to a meta-analysis by Yang and a study by Randhawa and Pujahari, Lal et al. and Khetan showing that increased GB wall thickness was associated with a difficult LC [3,4,11,16,17].

Our study also suggested that presence of mucocele or pyocele (p 0.012) was associated with a difficult LC mainly due to dense adhesions at the Calot's triangle (p 0.464), over distended gall bladder (p 0.401) and need for

suctioning of gall bladder before dissection from the liver bed. However these factors independently were not significant factors to consider a surgery a difficult LC. Acute attack of cholecystitis within the last 2 weeks, intrahepatic GB, dilated CBD and co morbidities like DM also showed no significance in our study in contrary to studies by Yang and Randhawa and Pujahari [3,4].

None of the variables evaluated showed significant effect on the post-operative length of stay and all except 4 patients were discharged on POD1. Drain was put in only one patient owing to bleeding at the Calot's triangle which was removed on POD2 and the patient was discharged on the same day. We saw only one conversion of Lap to open cholecystectomy (p 0.804) in the past 1 year owing to multiple co morbidities of the patient and difficult dissection at Calot's.

In our study of 70 patients we found that laparoscopic cholecystectomy was a very efficient method of relieving the patients of their symptoms and also providing the patients smaller scars, shorter hospital stays and lesser complications. It can easily be said that Laparoscopic cholecystectomy is indeed the gold standard for benign gall bladder pathologies.

But, it is very difficult to say pre operatively whether Laparoscopic Cholecystectomy is going to be easy or difficult based on clinical history. Identification of the preoperative sonological parameters, assessment of patient and Gall bladder factors could predict the risk for possible conversion and it would be useful for both patients and surgeons [11,18]. There are databases of research work present on this aspect; however there is no general consensus or level 1 evidence available regarding this.

We, as an institute saw very less number of conversions to open surgery and almost no CBD injuries. Cystic artery injuries were managed promptly and efficiently and no major complications were observed. This could be owed to the fact that we use a 4K HD system while performing LC which has a high resolution and better visualization. We also have high quality and efficient energy devices which are used for dissection as well as hemostasis [19,20].

Conclusion

In our study, we experienced that a lot of pre-operative factors affected the intra operative status of

surgery like difficult dissection at Calot's triangle, bile or stone spillage or cystic artery bleed which thereby affected the duration of the surgery and the length of stay. But there are a few limitations of our study. The sample size taken in our study is less. Moreover, there is Level 2 and 3 evidence, based on retrospective studies depicting certain factors that may predict difficult Laparoscopic Cholecystectomy such as patient's demography, history of acute cholecystitis, history of previous upper abdominal surgery, obesity, abnormal anatomy and most importantly, the experience of the surgeon. But higher levels of evidence and more research in this field is required.

So, the journey so far in our institute with regards to laparoscopic cholecystectomy has been good and we have been having a lot of newer faculty and trainee surgeons opting for various training sessions and workshops and effectively practicing minimally invasive surgeries here in our institute. But if we find out strong evidence showing a correlation between these variables and their effect on the surgery, we may have a premonition whether the surgery going to be performed is a difficult laparoscopic cholecystectomy and the surgeon may be prepared accordingly.

References

1. Bittner R (2006) Laparoscopic surgery: 15 years after clinical introduction. *World J Surg* 30(7): 1190-203.
2. Reynolds W (2001) The First Laparoscopic Cholecystectomy. *JSLs* 5(1): 89-94.
3. Yang TF, Guo L, Wang Q (2014) Evaluation of preoperative risk factor for converting laparoscopic to open cholecystectomy: A meta-analysis. *Hepato gastroenterology* 61(132): 958-965.
4. Randhawa JS, Pujahari AK (2009) Preoperative prediction of difficult lap chole: A scoring method. *Indian J Surg* 71(4): 198-201.
5. Hussain A (2011) Difficult Laparoscopic Cholecystectomy. *Surgical Laparoscopy, Endoscopy & Percutaneous Techniques* 21(4): 211-217.
6. Phillips H, Carroll BJ, Fallas MJ, Pearlstein AR (1994) Comparison of laparoscopic cholecystectomy in obese and non-obese patients. *Am Surg* 60(5): 316-321.
7. Nuzzo G, Giulante F, Persiani R (2004) The risk of biliary ductal injury during laparoscopic cholecystectomy. *J Chir (Paris)* 141(6): 343-353.
8. Angrisani L, Lorenzo M, De Palma G, Sivero L, Catanzano C, et al. (1995) Laparoscopic cholecystectomy in obese patients compared with non-obese patients. *Surg Laparosc Endosc* 5(3):197-201.
9. Rosen M, Brody F, Ponsky J (2002) Predictive factors for conversion of laparoscopic cholecystectomy. *Am J Surg* 184(3): 254-258.
10. Atta HM, Mohamed AA, Sewefy AM, Abdel-Fatah AS, Mohammed MM, et al. (2017) Difficult Laparoscopic Cholecystectomy and Trainees: Predictors and Results in an Academic Teaching Hospital. *Gastroenterology Research and Practice* pp: 1-5.
11. Lal P, Agarwal PN, Malik VK, Chakravarti AL (2002) A difficult laparoscopic cholecystectomy that requires conversion to open procedure can be predicted by preoperative ultrasonography. *JSLs* 6(1): 59-63.
12. Simopoulos C, Botaitis S, Polychronidis A, Tripsianis G, Karayiannakis AJ (2005) Risk factors for conversion of laparoscopic cholecystectomy to open cholecystectomy. *Surg Endosc* 19(7): 905-9.
13. Kama NA, Kolongue M, Doganay M, Reis E, Atle M, et al. (2001) Risk score for conversion from laparoscopic to open cholecystectomy. *Am J Surg* 181(6): 520-525.
14. Kanaan SA, Murayama KM, Merriam LT, Dawes LG, Puystowsky JB, et al. (2002) Risk factor for conversion of laparoscopic to open cholecystectomy. *J Surg Res* 106(1): 20-24.
15. Pavlidis TE, Marakis GN, Symeonidis N, Psarras K, Ballas K, et al. (2008) Considerations concerning laparoscopic cholecystectomy in the extremely elderly. *J Laparoendosc Adv Surg Tech A* 18(1): 56-60.
16. Khetan AK, Yeola M (2017) Preoperative prediction of difficult laparoscopic cholecystectomy using a scoring system. *International Surgery Journal* 4(10): 3388.
17. Carmody E, Arenson AM, Hanna S (1994) Failed or difficult laparoscopic cholecystectomy: Can

- preoperative ultrasonography identify potential problems?. *J Clin Ultrasound* 22(6): 391-396.
18. Daradkeh SS, Suwan Z, Abukhalaf M (1998) Pre-operative ultrasonography and prediction of technical difficulties during laparoscopic cholecystectomy. *World J Surg* 22(1): 75-77.
19. Bruno M, Didden P (2012) Faculty of 1000 evaluation for Meta-analysis of laparoscopic versus open cholecystectomy for patients with liver cirrhosis and symptomatic cholelithiasis. *F1000 -Post-publication Peer Review of the Biomedical Literature*.
20. Abdel Baki NA, Motawei MA, Soliman KE, Farouk AM (2006) Pre-operative prediction of difficult laparoscopic cholecystectomy using clinical and ultrasonographic parameters. *JMRI* 27(3): 102-107.

