

Difficult Laparoscopic Cholecystectomy and Associated Preoperative Factors: A Prospective Study from North IndiaGirish Pandey¹, Rajeev Ranjan²¹Associate Professor, Department of General Surgery, Heritage Institute of Medical Sciences, Varanasi, Uttar Pradesh, India²Assistant Professor, Department of Surgery, Netaji Subhas Medical College & Hospital, Bihta, Patna, Bihar, India

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Conflict of interest: Nil

Abstract:

Background: The majority of patients with symptomatic gallstones can benefit from laparoscopic cholecystectomy, according to the 1992 National Institute of Health (NIH) consensus development conference. As there is paucity of the studies assessing the preoperative factors associated with the difficult laparoscopic cholecystectomy, so we conducted this study with an aim to assess the preoperative factors associated with the difficult laparoscopic cholecystectomy.

Methods: The present hospital based prospective observational study was conducted in the Department of General Surgery, among 89 patients admitted with clinical diagnosis of cholelithiasis for laparoscopic cholecystectomy during 1 year of study period. For the enrolled patients, they underwent a thorough clinical examination and history taking. A pretested proforma was used to collect the patients details such as baseline and clinical characteristics laboratory and radiological parameters. All the cases were categorised to be easy, and difficult for laparoscopic cholecystectomy based. The analysis was carried in the MS excel and the association between independent and dependent variables was carried out using Chi-square test (for discrete variables). A p value <0.05 was considered as statistically significant.

Results: In our study a total of 89 patients underwent laparoscopic cholecystectomy. The mean age of patients was 47.82±20.42 years. The female patients were 66.3% and male patients were 33.7%. The Body Mass Index (BMI) was ≥ 25.0 kg/m² among 28.1% of patients. In our study, the gallbladder wall thickness of ≥4mm was seen in 59.3% of patients with difficult laparoscopic cholecystectomy, whereas 11.3% of patients with easy laparoscopic cholecystectomy. The variables such as raised TLC, elevated SA, deranged LFT, gallbladder wall thickness, contracted gall bladder and presence of Pericholecystic fluid were significantly associated with difficult laparoscopic cholecystectomy procedure.

Conclusion: In our study, a third of the patients had a difficult laparoscopic cholecystectomy, which was often followed by conversion to open cholecystectomy due to complications. So, a suitable tool for evaluating a challenging laparoscopic cholecystectomy is the clinical assessment.

Keywords: Gall bladder, Stone, Laparoscopic cholecystectomy, Murphy sign, Cholelithiasis.

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Introduction

One of the most frequent problems affecting the digestive tract is gallstone disease. Gallstone prevalence is influenced by variables including age, gender, and ethnicity. Gallstone prevalence varies greatly from region to region. There are an estimated 20 million Americans who suffer from gallstones, and each year, 1 million new cases of cholelithiasis are reported. The prevalence in India is thought to be around 4%, and changes in incidence are primarily due to dietary westernisation, changes in the socioeconomic structure, and the accessibility of ultrasound as a tool for examination in both rural and urban regions.[1,2]

The majority of patients with symptomatic gallstones can benefit from laparoscopic cholecystectomy, according to the 1992 National Institute of Health (NIH) consensus development conference. Nowadays, symptomatic cholelithiasis is thought to be best treated with laparoscopic cholecystectomy (LC). In terms of low postoperative pain, a shorter hospital stay, superior cosmetic results, and quick recovery, it has numerous advantages over open cholecystectomy.[3,4] Selection criteria have become more flexible as laparoscopic cholecystectomy experience has grown globally. Most of the conditions that used to be absolute

contraindication for attempting a laparoscopic cholecystectomy, such as extreme obesity and prior upper abdominal surgery, are no longer regarded to be contraindication. Over the time, there have been progressively less contraindications. With the exception of patients with bleeding diathesis, gallbladder cancer, and those who are not fit for general anaesthesia, attempts can be undertaken to remove gallstones using a laparoscopic surgery in all those cases.[5,6]

Nonetheless, 1–13% of laparoscopic cholecystectomies need to be converted to open procedures for a variety of reasons. In order to help surgeons, preoperative conversion risk assessment criteria should be developed. When the chance of conversion is high, this might be helpful for educating patients and assembling a surgical team with more experience. [7,8]

As there is paucity of the studies assessing the preoperative factors associated with the difficult laparoscopic cholecystectomy, so we conducted this study with an aim to assess the preoperative factors (baseline, clinical, laboratory, and radiological parameters) associated with the difficult laparoscopic cholecystectomy and conversion.

Materials and Methods

The present hospital based prospective observational study was conducted in the Department of General Surgery, Heritage Institute of Medical Sciences, Varanasi, Uttar Pradesh after obtaining the ethical approval from ethics review committee. The study was conducted among patients (>18 years of age) admitted with clinical diagnosis of cholelithiasis (gall bladder stone) after taking informed written consent during 1 year of study period (April 2021 to March 2022). The pregnant women, cases of carcinoma of gallbladder, and common bile duct (CBD) stone disease were

excluded from the study. So, a total of 89 patients were enrolled in the study.

For the enrolled patients, they underwent a thorough clinical examination and history taking. The required laboratory investigations were done. The USG/CT abdomen was also done for the patients. In our study, enrolled patients with gallbladder stone disease underwent for laparoscopic cholecystectomy.

A pretested proforma was used to collect the patients details such as baseline characteristics (age, gender and Body Mass Index), clinical history, clinical signs and symptoms, laboratory parameters (Total Leucocyte Count, Serum Amylase and Liver Function Test), Ultrasonography (USG)/CT abdomen findings (multiple stones, gall bladder thickness, contracted gall bladder, and pericholecystic fluid), and duration of surgery. All the cases were categorised to be easy, and difficult (including very difficult and conversion to open) for laparoscopic cholecystectomy based on baseline characteristics, clinical, laboratory and radiological parameters. The collected data was entered in the MS excel sheet. The continuous variables were presented as mean and SD, whereas discrete variables were presented as number and percentages. The analysis was carried in the MS excel and the association between independent and dependent variables was carried out using Chi-square test (for discrete variables). A p value <0.05 was considered as statistically significant.

Results

In our study a total of 89 patients underwent laparoscopic cholecystectomy. The mean age of patients was 47.82±20.42 years. The female patients were 66.3% and male patients were 33.7%. The Body Mass Index (BMI) was ≥ 25.0 kg/m² among 28.1% of patients (Table 1).

Table 1: Baseline characteristics of the patients undergoing Laparoscopic cholecystectomy

Variables	Number	%
Mean Age (in years)	47.82±20.42	
Age (in years)		
≤50	71	79.8
>50	17	19.2
Gender		
Male	30	33.7
Female	59	66.3
Body Mass Index (kg/m ²)		
<23	25	28.1
23-24.9	39	43.8
≥25.0	25	28.1

During the clinical examination of patients, murphy sign was positive among 24.7% of patients. The clinical history reflected that previous abdominal surgery history was found among 23.6% of patients. Also, clinical history showed that 13.5% of patients, had three or more episodes of gall bladder pain including current one and only 62.9% of patients presented to the hospital on having single episode of gall bladder pain (Table 2).

Table 2: Clinical Characteristics of the patients undergoing Laparoscopic cholecystectomy

Variables	Number	%
Murphy Sign		
Present	22	24.7
Absent	67	75.3
Previous Abdominal Surgery		
Yes	21	23.6
No	68	76.4
Number of episodes of gall bladder pain		
1	56	62.9
2	21	23.6
≥3	12	13.5

The laboratory investigation showed that the Total Leucocyte Count (TLC) levels were raised in 15.7% of patients. Also, 9.0% patients showed elevated Serum Amylase (SA) levels. The Liver Function Test (LFT) was deranged among 21.3% of patients (Table 3).

Table 3: Laboratory parameters of the patients undergoing Laparoscopic cholecystectomy

Variables	Number	%
Total Leucocyte Count (TLC)		
>11000/mm ³	14	15.7
4000-11000/mm ³	75	84.3
Elevated Serum Amylase (SA)		
Yes	8	9.0
No	81	91.0
Deranged Liver Function Test (LFT)		
Yes	19	21.3
No	70	78.7

The imaging (USG/CT abdomen) of patients showed that there was presence of multiple stones in gall bladder among 85.4% of patients. The gallbladder wall thickness of ≥4mm was seen in 25.8% of patients. The contracted gall bladder was seen in 28.1% of patients. The presence of pericholecystic fluid was observed in 13.5% of patients (Table 4).

Table 4: Imaging characteristics of the patients undergoing Laparoscopic cholecystectomy

Variables	Number	%
Presence of multiple stones		
Yes	76	85.4
No	13	14.6
Gallbladder wall thickness		
≥4mm	23	25.8
<4mm	66	74.2
Contracted gall bladder		
Yes	25	28.1
No	64	71.9
Presence of pericholecystic fluid		
Yes	12	13.5
No	77	86.5

During laparoscopic cholecystectomy procedure, it was easy among 69.7% of patients, whereas it was difficult in 30.3% of patients. The difficult laparoscopic cholecystectomy procedure included difficult (19/27), very difficult (6/27) and conversion to open cholecystectomy (2/27). The mean duration of laparoscopic cholecystectomy procedure was 23.42±18.37 minutes (Table 5).

Table 5: Intraoperative characteristics for the Laparoscopic cholecystectomy procedure

Variables	Number	%
Mean Duration of surgery (in minutes)	23.42±18.37	
Type of laparoscopic cholecystectomy		
Easy	62	69.7
Difficult	27	30.3

In our study, Chi-square analysis was done to find the association of the patients' various characteristics with the difficult or easy type of laparoscopic cholecystectomy procedure. It was observed that Murphy sign was present among 40.7% of patients with difficult laparoscopic cholecystectomy and it was present in 17.7% of patients with easy laparoscopic cholecystectomy. In our study, it was observed that 40.7% of patients with difficult laparoscopic cholecystectomy had

history of three or more episodes of gall bladder pain including current one present among and it was present in only 1.6% of patients with easy laparoscopic cholecystectomy.

The variables such as raised TLC, elevated SA, deranged LFT, gallbladder wall thickness, contracted gall bladder and presence of Pericholecystic fluid were significantly associated with difficult laparoscopic cholecystectomy procedure (Table 6).

Table 6: Association of the patients' various characteristics with the type of laparoscopic cholecystectomy

Variables	Laparoscopic cholecystectomy				P value
	Easy (n=62)		Difficult (n=27)		
	Number	%	Number	%	
Age (in years)					
>50	11	17.7	6	22.2	0.646
≤50	50	80.6	21	77.8	
Gender					
Male	20	32.3	10	37.0	0.661
Female	42	67.7	17	63.0	
Body Mass Index (kg/m ²)					
≥25.0	15	24.2	10	37.0	0.305
23-24.9	27	43.5	12	44.4	
<23	20	32.3	5	18.5	
Murphy Sign					
Present	11	17.7	11	40.7	0.020
Absent	51	82.3	16	59.3	
Previous Abdominal Surgery					
Yes	7	11.3	8	29.6	0.057
No	49	79.0	19	70.4	
Number of episodes of gall bladder pain					
1	48	77.4	8	29.6	<0.0001
2	13	21.0	8	29.6	
≥3	1	1.6	11	40.7	
Total Leucocyte Count (TLC)					
>11000/mm ³	4	6.5	10	37.0	0.0002
4000-11000/mm ³	58	93.5	17	63.0	
Elevated Serum Amylase (SA)					
Yes	2	3.2	6	22.2	0.003
No	60	96.8	21	77.8	
Deranged Liver Function Test (LFT)					
Yes	9	14.5	10	37.0	0.017
No	53	85.5	17	63.0	
Presence of Multiple stones					
Yes	50	80.6	26	96.3	0.054
No	12	19.4	1	3.7	
Gallbladder wall thickness					
≥4mm	7	11.3	16	59.3	<0.0001
<4mm	55	88.7	11	40.7	
Contracted gall bladder					
Yes	9	14.5	16	59.3	<0.0001
No	53	85.5	11	40.7	
Presence of Pericholecystic fluid					
Yes	5	8.1	7	25.9	0.023
No	57	91.9	20	74.1	

Discussion

In our study, although the male patients were more in difficult laparoscopic cholecystectomy (22.2%) as compared to easy laparoscopic cholecystectomy (17.7%), this difference was statistically insignificant ($p>0.05$). Male gender was considered as a predictive factor for difficult laparoscopic cholecystectomy as studies by Husain et al., and Kassa et al., have demonstrated that males with symptomatic gall stone disease are more susceptible to inflammation and fibrosis with the same disease intensity as compared to females.[9,10]

In our study, although the patients of age >50 years was more in difficult laparoscopic cholecystectomy (37.0%) as compared to easy laparoscopic cholecystectomy (32.3%), this difference was statistically insignificant ($p>0.05$). According to studies by Strasberg et al., and Barkun et al., age >50 years generally makes laparoscopic cholecystectomy difficult since older patients are more likely to experience recurrent cholecystitis attacks and have a history of operative surgery.[11,12]

In our study, although the obese patients were more in difficult laparoscopic cholecystectomy (37.0%) as compared to easy laparoscopic cholecystectomy (24.2%), this difference was statistically insignificant ($p>0.05$). According to the study by Bunkar et al., obesity makes it harder to identify anatomy and causes the umbilicus to be shifted downward, which makes it difficult to locate the umbilical port. It also makes it difficult to distinguish the umbilical fascia.[13]

In our study, although the history of previous abdominal surgery was more in difficult laparoscopic cholecystectomy (29.6%) as compared to easy laparoscopic cholecystectomy (11.2%), this difference was statistically insignificant ($p>0.05$). Adhesions may result from prior surgical surgery. According to studies by Nachnani et al., and Gupta et al., the presence of adhesions, particularly those that are supraumbilical and umbilical, is demonstrated to be a predictor of challenging laparoscopic cholecystectomy, which restricts the assessment to the gall bladder. Thus, the appearance of a supraumbilical scar is thought to be a sign of a challenging laparoscopic cholecystectomy.[8,14]

In our study, it was observed that 40.7% of patients with difficult laparoscopic cholecystectomy had history of three or more episodes of gall bladder pain including current one present among and it was present in only 1.6% of patients with easy laparoscopic cholecystectomy. Studies by Barkun et al. and Alponat et al. have demonstrated that the gall bladder becomes fibrosed and contracted as a result of cholecystitis episodes, making it difficult to grasp the gall bladder. Hence, a difficult laparoscopic

cholecystectomy is predicted by a history of hospitalization for gall stone disorders.[8,15]

In our study, the gallbladder wall thickness of ≥ 4 mm was seen in 59.3% of patients with difficult laparoscopic cholecystectomy, whereas 11.3% of patients with easy laparoscopic cholecystectomy. Studies by Kassa et al. and Bunkar et al. have demonstrated that gallbladder inflammation makes it challenging to grasp the gallbladder with delicate laparoscopic instruments, increasing the length of the procedure and making it challenging to operate the gallbladder.[10,13]

In our study, the presence of pericholecystic fluid was seen in 25.9% of patients with difficult laparoscopic cholecystectomy, whereas 8.1% of patients with easy laparoscopic cholecystectomy. According to studies by Kassa et al., and Agrawal et al., the presence of inflammatory fluid outside of the gall bladder is more frequently related with dense adhesions as well as difficulty detecting the calot's triangle because of inflammation and anatomical distortion. As a result, the appearance of a pericholecystic collection on a USG is thought to indicate a challenging laparoscopic cholecystectomy, while the lack of a pericholecystic collection indicates a simple laparoscopic cholecystectomy.[10,16]

In our study, the presence of multiple stones was seen in 96.3% of patients with difficult laparoscopic cholecystectomy, whereas 80.6% of patients with easy laparoscopic cholecystectomy. Studies by Bunkar et al., and Agrawal et al., have demonstrated that the presence of multiple, large stones in the gall bladder neck causes distention and difficulty in grasping, making laparoscopic cholecystectomy challenging during calot's dissection and during the times of duct identification and clipping.[13,16]

Conclusion

In our study, a third of the patients had a difficult laparoscopic cholecystectomy, which was often followed by conversion to open cholecystectomy due to complications such as murphy's sign, deranged LFTs, pericholecystic fluid, $TLC > 11000/mm^3$, gall bladder with thickness > 4 mm, elevated serum amylase, and previous attack and contracted gall bladder. So, a suitable tool for evaluating a challenging laparoscopic cholecystectomy is the clinical assessment.

References

1. Brunt LM, Soper NJ. Outcomes of Minimal Access versus Open Surgical Procedures in the Elderly. In Principles and Practice of Geriatric Surgery. Springer, New York, NY. 2001;1036-53.
2. Soper NJ, Stockmann PT, Dunnegan DL, Ashley SW. Laparoscopic cholecystectomy the

- new "gold standard"? Arch Surg. 1992;127(8):917-23.
3. Williams NS, O'Connell PR, McCaskie A, editors. Bailey and Love's short practice of surgery. CRC press. 2018.
 4. Gollan JL, Bulkley GB, Diehl AM, Elashoff JD, Federle MP, Hogan WJ et al. Gallstones and laparoscopic cholecystectomy. JAMA. 1993;269(8):1018-24.
 5. Soper NJ. Laparoscopic cholecystectomy. In Current Review of Minimally Invasive Surgery Springer, New York, NY. 1998;1-12.
 6. Bass EB, Pitt HA, Lillemoe KD. Cost-effectiveness of laparoscopic cholecystectomy versus open cholecystectomy. Am J Surg. 1993;165(4):466-71.
 7. McMahon AJ, Baxter JN, Anderson JR, Ramsay G, O'Dwyer PJ, Russell IT et al. Laparoscopic versus minilaparotomy cholecystectomy: a randomised trial. Lancet. 1994;343(8890):135-8.
 8. Barkun JS, Sampalls JS, Fried G, Wexler MJ, Meakins JL, Taylor B et al. Randomised controlled trial of laparoscopic versus mini cholecystectomy. Lancet. 1992;340(8828):1116-9.
 9. Husain A, Pathak S, Firdaus H. Assessment of operative predictors for difficulty in laparoscopic cholecystectomy. Int J Contemporary Med Res. 2016;3(4):1232-4.
 10. Kassa V, Jaiswal R. Assessment of risk factors for difficult surgery in laparoscopic cholecystectomy. Int Med J. 2017;4(2):5.
 11. Strasberg SM. The pathogenesis of cholesterol gallstones a review. J Gastrointest Surg. 1998;2:109.
 12. Bunkar SK, Yadav S, Singh A, Agarwal K, Sharma P, Sharma AC. Factors predicting difficult laparoscopic cholecystectomy: a single institution experience. Int Surg J. 2017;4(5):1743-7.
 13. Nachnani J, Supe A. Pre-operative prediction of difficult laparoscopic cholecystectomy using clinical and ultrasonographic parameters. Indian J Gastroenterol. 2005;24:16-8.
 14. Gupta N, Ranjan G, Arora MP. Validation of a scoring system to predict difficult laparoscopic cholecystectomy. Int J Surg. 2013;11(9):1002-6.
 15. Alponat A, Kum CK, Koh BC, Rajnakova A, Goh PMY. Predictive Factors for Conversion of Laparoscopic Cholecystectomy. World J Surg. 1997;21(6):629-33.
 16. Agrawal N, Singh S, Khichy S. Preoperative Prediction of Difficult Laparoscopic Cholecystectomy: A Scoring Method. Niger J Surg. 2015;21(2):130-3.