

ORIGINAL ARTICLE

Study of Correlation of Preoperative Clinical Findings, Laboratory Investigations and Sonological Findings on Peroperative Parameters in Gall Stone Disease

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ABSTRACT

BACKGROUND AND OBJECTIVES: Within a short span of merely two decades since its introduction, laparoscopic cholecystectomy (LC) has become widely accepted as the procedure of choice for symptomatic gall bladder disease. The degree of difficulty is again impossible to predict. Our objective is to study clinical findings, sonological and investigational findings which can predict difficulty and overall outcome in Laparoscopic Cholecystectomy. **METHODS:** This prospective study is carried out in the department of general surgery with 50 cases with signs and symptoms of cholelithiasis / cholecystitis selected by purposive sampling from November 2015 to October 2017. Uni-variate analysis was performed using the chi square test to determine the preoperative clinical, sonological and investigational factors that were associated with difficulty in LC. **RESULTS:** The common reasons for difficulty in our studies were as follows: dense adhesions(24%), spillage of bile(20%), intra operative bleeding(22%), difficulty in dissection of calot's triangle (32%), spillage of gall bladder stones(4%), difficulty in extraction of gall bladder(16%) and difficulty in port placement(18%). Clinical factors like obesity (BMI $\geq 25\text{kg/m}^2$) investigation like altered LFT and sonological finding like size of the stone, gall bladder wall thickness $>3\text{mm}$ and pericholecystic oedema can help to predict difficult laparoscopic cholecystectomy and conversion to open. **CONCLUSION:** With proper preoperative assessment of clinical, investigational and sonological parameters the best possible results can be imparted to the patient undergoing laparoscopic cholecystectomy. Conversion is neither a failure nor a complication but it is an attempt to minimize the complications.

Keywords: laparoscopic cholecystectomy, conversion, pre-operative parameters

INTRODUCTION

Minimal access surgery is a marriage of modern technology and surgical innovation that aims to accomplish surgical therapeutic goals with minimal somatic and psychological trauma. This type of surgery has reduced wound access trauma as well as being less disfiguring than conventional techniques. With increasing experience it offers cost-effectiveness both to health services and to employers by shortening operating times, shortening hospital stays and allowing faster recuperation. Laparoscopic procedures can be divided into basic laparoscopic procedure & advanced laparoscopic procedure.

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Today due to advancement in technical aspects, trained assistants & experienced surgeon, many operative procedures are done laparoscopically.

Examples are as follows:

- Diagnostic laparoscopy
- Appendectomy
- Cholecystectomy & CBD exploration
- Hernia repair
- Nissen's fundoplication
- Heller's cardiomyotomy
- Gastrojejunostomy
- Intracorporeal anastomosis
- Pancreatectomy
- Splenectomy
- Colectomy
- Prostatectomy
- Nephrectomy
- Adrenalectomy & others.

Within a short span of merely two decades since its introduction, laparoscopic cholecystectomy has become widely accepted as the procedure of choice for

symptomatic gall bladder disease. With growing experience, wider application of laparoscopy for technically difficult and high risk patients it was expected that the complication rates would rise as also the rate of conversion to the open cholecystectomy. At times it is minimally invasive, causes less pain & early recovery but sometimes LC becomes difficult. The degree of difficulty is again impossible to predict. In this study we have worked on a preoperative clinical findings, sonological and investigational findings which can predict difficulty & degree of difficulty.

MATERIALS AND METHODS

- This prospective study is carried out in the department of general surgery in the various surgical wards in our institute.
- The number of cases considered for the study were 50.

Study setting:

All patients admitted with signs and symptoms of cholelithiasis / cholecystitis in various surgical wards under General Surgery care and operated by laparoscopic surgeons in our institute would be taken as subjects for this study.

Study period:

Study was conducted after ethical approval from November 2015 to October 2017.

Sampling Technique:

Purposive sampling

Statistical Method:

Sample size calculated by using open epi software considering the proportion of cholecystitis/cholelithiasis patients in department of general surgery at our institute as 3 % (p), with 95% level of inference (Z alpha/2) with allowable error as 5%(L).

$$N = (Z \alpha/2)^2 pq/L^2 = (1.96)^2(0.03) (1-0.03) / (0.05)^2$$

$$N = 44.71$$

We have taken 50 number of cases for round figure.

Uni-variate analysis was performed using the chi square test by epi info software to determine the preoperative clinical, sonological and investigational factors that were associated with conversion of (LC) laparoscopic cholecystectomy to (OC)

open cholecystectomy. P value was considered significant <0.05.

OBSERVATIONS

Table 1: Sex Distribution

Sex	No Of Patients
Male	17
Female	33

It shows high incidence of symptomatic gall stone disease in female gender.

Table 2: Age Distribution

Age(Yrs)	Male	Female	Total
<20	1	0	1
21-30	2	12	14
31-40	2	5	7
41-50	2	5	7
51-60	6	5	11
61-70	3	5	8
>70	1	1	2

In this study out of 50 cases, max no of patients are in 21-30 years of age group (14 cases). The youngest patient was 20 years old male patient and The most elder patient was 80 year old male patient. Mean age was 45.94 years.

Table 3: Symptomatology in Cholecystitis Patients

Symptoms	No of cases	Percentage
Abdominal Pain	49	98%
Nausea	34	68%
Vomiting	8	16%
Anorexia	8	16%
Fever	1	2%

Table 4: Correlation between Age and Difficulty in Laparoscopic Cholecystectomy

Clinical Parameter	Variable	Easy	Difficult	Total
Age	<50	14(51.85%)	13(48.15%)	27
	=/>50	13(56.53%)	10(43.47%)	23

Age is not a statistically significant pre operative factor for predicting difficulty in this study (p -0.7412).

Table 5: Correlation between Gender and Difficulty in Laparoscopic Cholecystectomy

Clinical Parameter	Variable	Easy	Difficult	Total
Gender	Male	7(41.18%)	10(58.82%)	17
	Female	19(57.58%)	14(42.42%)	33

Gender is not a statistically significant pre-operative factor for predicting difficulty in this study (p- 0.2715).

Table 6: Correlation between Duration of Symptoms and Difficulty in Laparoscopic Cholecystectomy

Clinical Parameter	Variables	Easy	Difficult	Total
Duration Of Symptoms	< 6 Months	27(87.09%)	4(12.91%)	31
	≥6 Months	13(68.42%)	6(31.58%)	19

Difficulty: in calot's triangle dissection and adhesions

Duration of symptoms is not statistically significant pre-operative factor for predicting difficulty in this study (p-2.5679)

Table 7: Previous Attacks of Cholecystitis and Correlation with Difficulties in Lap Cholecystectomy

Previous Attack Of Cholecystitis	No Of Patients	Difficulties In Laparoscopic Cholecystectomy	
		Easy	Difficult
Present	5	4(80%)	1(20%)
Absent	45	36(80%)	9(20%)

Difficulty: intra op adhesion and difficulty in calot's triangle dissection

Previous attack of acute cholecystitis is statistically non-significant pre-operative factor for predicting difficulty in this study (p- 1)

Table 8: Correlation between Previous Surgery and Difficulty in Laparoscopic Cholecystectomy

Clinical Parameter	Variable	Easy	Difficult	Total
Previous Surgery	No	25(80.64%)	6(19.36%)	31
	YES	15(78.94%)	4(21.06%)	19

Difficulty: intra op adhesion and difficulty in calot's triangle dissection

History of previous abdominal surgery is not statistically significant preoperative factor predicting difficulty in this study (p-0.8841)

Table 9: Correlation of BMI and Difficulty in Laparoscopic Cholecystectomy

BMI	No of patients	Difficulties in laparoscopic cholecystectomy	
		Easy	Difficult
<25	33	30(90.90%)	3(9.10%)
≥25	17	11(64.70%)	6(35.30%)

Difficulty: port placement, port site closure BMI is statistically significant pre-operative factor for predicting difficulty (P- 0.0223).

Table 10: Correlation of No of Gall Stone and Its Relation with Lap. Cholecystectomy Difficulty

No of gall stones	No of patients	Difficulties in laparoscopic cholecystectomy	
		Easy	Difficult
Single	12	7(58.33%)	5(41.66%)
Multiple	38	19(50%)	19(50%)

Number of stone is not a statistically significant pre-operative factor for predicting difficulty in this study. (p-0.6144)

Table 11: Size of Largest Stone and Correlation with Difficulties in Laproscopic Cholecystectomy

Size Of Largest Stone	No Of Patients	Difficulties In Laparoscopic Cholecystectomy	
		Easy	Difficult
<10mm	28	27(96.42%)	1(3.58%)
>10mm	22	15(68.18%)	7(31.82%)

Difficulty: extraction of gall bladder
Large size of stone is a statistically significant pre-operative factor for predicting difficulty in this study. (p-0.0068)

Table 12: GB Wall Thickness and Correlation with Difficulties in Laproscopic Cholecystectomy

GB Wall Thickness	No Of Patients	Difficulties In Laparoscopic Cholecystectomy	
		Easy	Difficult
<3mm(Normal)	34	28(82.35%)	6(17.65%)
>3mm	16	6(37.5%)	10(62.5%)

Difficulty: dissection of calot's triangle
Gall bladder wall thickness is a statistically significant pre-operative factor for predicting difficulty in this study. (p-0.0015)

Table 13: GB Condition and Correlation with Difficulties in Laproscopic Cholecystectomy

GB Condition	No Of Patients	Difficulties In Laparoscopic Cholecystectomy	
		Easy	Difficult
Distended	46	33(71.73%)	13(28.57%)
Contracted	4	1(25%)	3(75%)

Difficulty: dissection of calot's triangle
Contracted gall bladder on USG findings is not a statistically significant pre-operative factor predicting difficulty. (p-3.6945)

Table 14: Pericholecystic Edema with Difficulties in Laparoscopic

Pericholecystic Edema	No. Of Patients	Difficulty In Lap Cholecystectomy	
		Easy	Difficult
No	43	33(76.74%)	10(23.26%)
Yes	7	1(14.28%)	6(85.72%)

Difficulty: dissection of calot’s triangle
Pericholecystic oedema in USG findings is a statistically significant pre-operative factor predicting difficulty. (P 0.0010)

Table 15: Correlation of Leucocytosis and Difficulty in Laparoscopic Cholecystectomy

	Variable	Easy	Difficult	Total
Leucocytosis (>10000)	No	21(55.26%)	17(44.74%)	38
	YES	04(33.34%)	08(66.66%)	12

Leucocytosis is a statistically not significant pre-operative factor predicting difficulty. (P 0.1853)

Table 16: Correlation of Altered Investigation and Difficulty in Laparoscopic Cholecystectomy

Altered Investigations(Liver Enzymes)	Variable	Difficulties In Laparoscopic Cholecystectomy		Total
		Easy	Difficult	
Altered LFT	No	30(88.24%)	4(11.76%)	34
	YES	3(18.75%)	13(81.25%)	16

Altered LFT is a statistically significant pre-operative factor predicting difficulty. (P 0.000001)

Table 17: Correlation of Difficulties Encountered with No. Of Patients

Difficulties Encountered	No. Of Patients
Time Duration	
1. <60 Min	04
2. >60 Mins But <120 Mins	15
3. >120 Mins	05
Adhesions	12
Spillage Of Bile	10
Intra Operatively Bleeding	11
Difficulty In Dissection Of Calot’s Triangle	16
Difficulty In Extraction Of Gall Bladder	08
Spillage Of Stones	02
Difficulty In Port Placement	09

Table 18: Total No of Cases and Surgical Procedure Is Done

Group	No Of Cases	Percentage
Laparoscopic Cholecystectomy	49	98%
Laparoscopic cholecystectomy Converted To Open Cholecystectomy	1	2%

DISCUSSION

Safe dissection is the key, to complete laparoscopic cholecystectomy successfully. Every case should be considered as difficult until completed successfully. It is very difficult to say pre operatively whether it is going to be easy or difficult. The degree of difficulty is again impossible to predict. Randhawa J S, Pujahari A K¹ in 2009 proposed a scoring system for pre-operative prediction of level of difficulty.

Evaluation of Pre Operative Factors – Clinical Parameters:

Age:

Age is an independent factor for considering surgical as well as anesthetic complication. In previous studies^{2, 5,6,7,10,11}, age more than 60 years is considered a significant factor for predicting difficulties & conversion to open surgery. In study by Randhawa¹ age factor more than 50 years was given higher score for evaluation of scoring system. Study showed that age was not a statistically significant factor for predicting difficulty for age more than 50 years. In this study we also found age factor as a non-significant factor for predicting difficulty. (Table 4). Mean age in our study was 45.94 years & maximum patient were in the age group 21-30 years. (Table-2). Earlier gall stone disease was prevalent after 4th decade of life but this study shows increased prevalence in early age groups as well which can be explained by better diagnostic imaging modalities, changing food patterns of the population & awareness on the part of the patient. Low threshold for surgical management of gall stone disease may be explained by simplicity of the procedure & increasing awareness of the condition is general population.

Gender:

Gall stone disease is prevalent in female sex. In previous studies by David et al² & Kama et al⁷ male gender was found as a significant factor in predicting conversion to open procedure. On the contrary study by Chileung et al⁵ found gender as a non-

significant factor. In our study male gender is a non-significant pre-operative variable for predicting difficulty (table-5). Gender factor has to be evaluated in association of other factors. Prevalence of systemic disease (diabetes, hypertension, ischemic heart disease) in males is usually associated with higher anaesthetic risk but technical difficulty in the procedure has to be further evaluated on the basis of gender.

Duration of Symptoms:

Majority of the patient of gall stone disease are asymptomatic. There is role of conservative management of gall stone disease. We have studied correlation of duration of symptoms & level of pre-operative difficulty. We found this factor as a non-significant factor for predicting difficult procedure (table-6).

Past History of Attack Of Acute Cholecystitis:

Acute cholecystitis is a common clinical presentation of gall stone disease & a common complication as well, that requires hospital admission, intravenous antibiotics & intravenous fluids. Earlier acute illness was a contraindication for operative intervention but with this era of advancement in equipments & experienced surgeon it is no more a contraindication. In our study we have excluded the patient undergoing surgical intervention for acute condition. There is no doubts that surgical intervention in acute condition will lead to difficulty & higher probability of conversion to open but in previous studies a past history of acute attack is also a significant factor for predicting difficulty & higher conversion rate. Kama et al⁷ & Nechnani J et al¹⁴ showed that previous attack of acute cholecystitis predicts perioperative difficulty & higher probability of conversion to open. These both developed a scoring system & an equation for predicting conversion to open procedure. Randhawa et al¹ found it highly significant for predicting difficult procedure. It is explained by the fact that an event of acute cholecystitis will lead to fibrosed gall bladder with adhesions with

omentum & bowels which will lead to intra operative difficulty. Repeated attacks will further deteriorate the anatomy of calot's triangle. In our study it is not significant statistically.

Previous Abdominal Surgery:

Previous abdominal surgery is also studied in this study. It is a basic surgical principle that it will be always difficult to operate on an area previously injured or operated. These will be distortion of normal anatomy with excessive fibrous tissue. In case of abdominal surgery healing will lead to inter bowel adhesions, adhesions between abdominal wall & bowels & adhesions with solid organs. These adhesions will lead to difficulty in accessing the abdomen during any future open or laparoscopic surgery. Kama et al⁷ found a previous upper abdominal surgery as a significant risk factor for predicting conversion to open surgery. In study by Randhawa¹, this factor was not significant for predicting difficult procedure. In our study it is a non-significant pre-operative factor as a predicting difficult procedure as a sole factor.

Body Mass Index:

Obesity is a one of the important risk factor for developing symptomatic gall stone disease. Previous studies^{3,5,9,10} shows higher conversion rate in obese group. Randhwa et al also found body mass index (BMI) as a pre-operative factor predicting difficult procedure & included in developing scoring system. In our study, BMI is found statistically significant pre-operative factor for predicting difficult procedure. It can be explained by few facts: 1. it will lead to access problems. 2. It will lead to difficulty in dissection of calot's triangle due to excessive fat 3. Due to pendulous abdomen port placement may require different unfamiliar position for surgeon. 4. Post site sheath closure will be very difficult in obese group which will lead to increased operative time.

Transabdominal Ultrasonographic Findings for Prediction of Difficult Lap. Cholecystectomy:

An ultrasound will show stones in the gallbladder with sensitivity and specificity of over 90%¹³. It can demonstrate biliary calculi, the size of the gall bladder, the thickness of the gall bladder wall, the presence of inflammation around the gall bladder, the size of the common bile duct and, occasionally, the presence of stones within the biliary tree. There are numerous studies for correlating the USG findings with intra operative difficulties. In 1996 Santambogio et al⁴ studied USG findings in 143 cases with symptomatic cholelithiasis. On the basis of these findings a predictive judgement of technical difficulties was expressed by degree: easy, difficult & very difficult. A significant correlation was found between the USG classification & intraoperative technical difficulties during the dissection of calot's triangle & dissection of the GB bed. The mean operative time progressively increased according to the ultrasonographic classification. In 1997 Jansen S et al¹² studied findings in 738 patient to predict low risk group suitable for day care surgery. They found 4 findings significant for predicting possible conversion. Those are 1. Stone size > 20mm, 2. Gall bladder wall thickness > 4mm, 3. A common bile duct wider than 6mm & 4. Contracted gall bladder on ultrasound. The number of stones in the gall bladder was not significant. In this study 84% of patient categorized in low risk group which were possibly suitable for outpatient procedure so called "ambulatory cholecystectomy". In current study, Transabdominal Ultrasonography was used as a basic investigation for imaging GB & related pathology. Three findings 1. GB wall thickness, 2. Size of stone & 3. Pericholecysticoedema were statistically significant in predicting difficulty in laparoscopic cholecystectomy. Number of stones was found non-significant. These results were consistent with previous studies. It is our common experience that thickened GB wall is very difficult to grasp with routine graspers during dissection. Contracted GB results

following excessive fibrosis. It also adds difficulty because of poor holding of GB, difficulty in dissection from liver bed & higher chances of per operative bleeding & biliary spillage. Impacted stone in Hartmann's pouch leads to more chances of GB wall perforation & bile spillage which increases operative time & difficulty in clipping the duct.

Correlation of Leucocytosis and Difficulty in Laproscopic Cholecystectomy

Leucocytosis is a statistically not significant pre-operative factor predicting difficulty. (p 0.1853)

Correlation of Altered Investigation and Difficulty in Laproscopic Cholecystectomy

Altered LFT is a statistically significant pre-operative factor predicting difficulty. It may be explained by the fact that inflammation of biliary tree and impacted stones may be the reason for altered LFT which in turn leads to adhesions and fibrosis which factors encounter difficulty in dissection during laparoscopic cholecystectomy.

Conversion Rate:

"It is not a 'failure' but is 'safer' to convert when necessary'. 'Conversion rate is higher in acute condition than elective procedure⁸.

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. Laparoscopic cholecystectomy can be a straightforward operation, but may also be an operative approach fraught with underlying complexities. In certain situations laparoscopic cholecystectomy is a challenging job. By proper pre-operative assessment of the patient using clinical, investigational and sonological parameters, surgeon can impart the best possible outcome to the patient. Thus, we conclude as follows:

1. Patients with high predicted risk of conversion could be operated on either

- by or under supervision of more experienced surgeon.
2. 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 duration of surgery and associated morbidity.
 3. With proper preoperative assessment of clinical, investigational and sonological parameters the best possible results can be imparted to the patient undergoing laparoscopic cholecystectomy.
 4. Objective criteria should be defined to assess a surgery as difficult and time taken in performance of surgery should not be taken as a marker of difficult surgery.

Thus we can infer that conversion is neither a failure nor a complication but it is an attempt to minimize the complications.

REFERENCES

1. Randhawa J S, Pujahari A K (2009), preoperative prediction of difficult lap chole: a scoring system. *Indian J surg* 71:198-201.
2. David C. Wherry, Charles G. Rob, Michael R. Marohn, Rorman m. Rich, An external audit of laparoscopic cholecystectomy performed in medical treatment facilities of the department of defence, *Ann of Surg*, Vol 220, 5:626-634, 1994
3. Fried GM, Barkum JS, Sigman HH, Joseph L, Clas D, Garzon J, Hinchey EJ, Meakins JL, Factors determining conversion to laparotomy in patients undergoing laparoscopic cholecystectomy. *Am J surg* 167:35-41
4. Roberto Santambrogio, Marco Montorsi, Paolo Bianchi, Enrico Opocher, Luca Schubert, Maurizio Verga, Luca Federico, Gianpaolo Spina, Technical difficulties and complications during laparoscopic cholecystectomy: predictive use of preoperative ultrasonography, *Worlds J Surg*. 20:978-982, 1996
5. Chi-leung Liu, Sheing-tat Fan, Edward C.S. lai, Chung-Mau Lo, Kent-man Chu, Factors Affecting conversion of Laparoscopic Cholecystectomy to open surgery, *Arch surg*. 1996; 131(1):98-101.
6. Jansen S, Jorgensen J, Caplehorn J, Hunt D, Preoperative ultra sound to predict conversion in laparoscopic cholecystectomy, *surg Laparosc Endosc*. 7(2):121-3, 1997
7. Kama NA, Kolongue M, Doganay M, Reis E, Atle M, Dolapiu M (2001) Risk Score conversion from laparoscopic cholecystectomy. *Am J surg* 187:520-525
8. Iftikhar A. Khan, Omer E. El-Tinay, Laparoscopic cholecystectomy for acute cholecystitis, Can preoperative factors predict conversion ?, *Saudi Med J* 2004; Vol. 25 (3) :299-302
9. Nachnani J. Supe A: Pre-operative prediction of difficult laparoscopic cholecystectomy using clinical and ultrasonographic parameters. *Indian J Gastrointerol* 2005 , 24:16-18
10. Ashfaq Chandio, Suzanne Timmons, Aamir Majeed, Aongus Twomey, and Faud Aftab Chandio, Factors influencing the successful completion of Laparoscopic Cholecystectomy, *JLS (Journal of the society of Laparoendoscopic Surgeons)* 13(4): 581-586, 2009
11. Haytham M.A. Kaaarani, Tracy Schiffner Smith, Leigh Neumayer, David H. Berger, Ralph G. Depalma, Kamal M.F. itani, Trends, outcomes, and predictors of open and conversion to open cholecystectomy in veterans Health Administration hospitals, *Am J surg* 200, 32-49, 2010
12. Biliary System, Sabiston Textbook of Surgery, 18th edition, 2008
13. Gall bladder and the extrahepatic biliary system, *Schwartz's principles of surgery*. 8th edition, 2007
14. Jagdish Nachnani, Avinash Supe: Preoperative prediction of difficult laparoscopic cholecystectomy using clinical and ultrasonographic parameters. *Indian journal of Gastroenterology*, (2005); 24:16-180.

