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Clinical and Sonological Predictors for Difficult Laparoscopic Cholecystectomy

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Abstract
Background: *Laparoscopic cholecystectomy (LC) has become the gold standard treatment for gallstone disease. Though mostly safe occasionally it can be difficult due to various problems faced during surgical procedure. Anticipation of likely difficulty can help in avoiding complications and legal aspect.*
Methods: *With the aim of identifying various predictors of difficulty and their correlation with likely difficulty this prospective study on 100 patients undergoing laparoscopic cholecystectomy for symptomatic cholelithiasis was undertaken. Various clinical, sonological predictors were recorded and assessed for intraoperative difficulties and frequency of difficult laparoscopic cholecystectomy was recorded.*
Results: *100 patients were studied with age ranging from 10-80 years, maximum incidence of difficult LC (36.14%) being in the age group 41-50 years. The time taken for LC increased significantly with increasing age. Gender affects the difficulty i.e. 48.15 % difficulty in male as compared to 24.66% among female patients. Body mass index (BMI) > 25 did not show any significance with difficult cholecystectomy. Previous history of multiple attacks of acute cholecystitis, h/o ERCP with CBD stenting, Upper abdominal surgery, clinically tender palpable GB, USG evidence of contracted/distended GB, impacted stone at GB neck, GB wall thickness >4 mm, multiple stones in GB had increased rate of difficult cholecystectomy and the conversion rate.*
Conclusions: *Clinical predictors are most reliable factors. Use of good clinical judgment regarding possibility of and likely difficulty along with understanding of available resources is important in making decision in each case.*

Keywords: *Clinical, Sonological, Difficult laparoscopic cholecystectomy, Predictors*

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I. Introduction

Gallstone disease is one of the most common problems affecting the digestive tract. The prevalence of gallstones is related to factors like age, gender, and ethnic background. The prevalence of gallstone varies widely from place to place[1]. The prevalence of cholelithiasis is 10-15% in India, and approximately 1-2% of asymptomatic patients will develop symptoms and required cholecystectomy every year.[2] Laparoscopic cholecystectomy has become the procedure of choice for management of symptomatic gallstone disease for its minimal invasive, less pain and early recovery.[3,4] At times, Laparoscopic Cholecystectomy becomes difficult. It takes longer time even with bile/stone spillage and occasionally it requires conversion to open cholecystectomy. Obviously, if conversion is necessary for whatever reason, the benefit of the minimal access concept is lost. . Laparoscopic Cholecystectomy which takes more than expected time with any of these problems is considered as difficult. However, of all Laparoscopic cholecystectomies, 1-13% requires conversion to an open for various reasons.[5] Some of the reasons quoted in earlier studies are followings:[6]

- Elderly patients are more likely to have a difficult LC.
- Females undergo this surgery more frequently but males tend to have a higher number of difficult cases.
- Recurrent cholecystitis is a predictor.
- Obese patients and those with recurrent cholecystitis tend to have more difficulties during surgery.
- Previous surgery predisposes towards difficulties in cholecystectomy.
- Patients who needed preoperative ERCP had more chances of having a difficult cholecystectomy.
- Pre operative USG can predict difficulties during LC.

- Features like, over distended due to impacted stone at hartman pouch or contracted gallbladder, intraperitoneal adhesions, structural anomalies or distortions and the presence of a cirrhotic liver are signs that are associated with subsequent difficulties during the surgery.

The difficult gall bladder is the most commonly performed "difficult" laparoscopic surgery by the general surgeons all over the world and the potential one that places not only the patient under risk but also places the operating surgeon in hot soup.[10]Difficult laparoscopic cholecystectomy can be predicted pre-operatively. Preoperative prediction of "difficult laparoscopic cholecystectomy" may not only improve patient safety but also be useful in reducing the overall cost of therapy.[7] Pre-operative prediction of possible difficulties may help a surgeon deciding the approach (open or laparoscopic) most suitable for a particular patient, counseling the patient about it, thereby reducing the morbidity, complications, rate of conversion and the overall cost of therapy. Thus, for surgeons it would be helpful to establish criteria that would assess the risk of conversion preoperatively. Knowledge of these factors may be used for the preoperative counseling of the patients regarding the successful outcome of the surgery as well as to predict the risk of conversion preoperatively for selected patients, prepare the patient psychologically, arrange operating schedules accordingly, and minimize the procedure-related cost and help overcome financial constraints, which is a significant problem in developing countries and possibility of the conversion so that needful arrangements can be made by the patients.[8,9] This would be useful for informing patients and a more experienced surgical team could be assembled when risk for conversion appears significant.

II. Method

All cases of symptomatic gallstones undergoing elective LC at IGMC hospital were studied over one year in a prospective manner.

Inclusion criteria: All the patients undergoing elective laparoscopic cholecystectomy due to following gall stone diseases:

1. Symptomatic cholelithiasis
2. Empyema gall bladder
3. Mucocoele gall bladder
4. Gall bladder polyp
5. Biliary pancreatitis

Exclusion criteria

1. Patients scheduled for Emergency LC for calculous acute cholecystitis or indicated for a primary open procedure.
2. Patients with common bile duct calculus
3. Patient with suspicion of ca gall bladder
4. Features of obstructive jaundice
5. Cholelithiaisis during pregnancy
6. Absolute contraindications to LC like cardiovascular, pulmonary disease, coagulopathies and end stage liver disease.
7. Laparoscopic cholecystectomy performed with other laparoscopic intervention in same setting.

The selected patients were counseled about the procedure and written informed consent was taken regarding participation in the study as well as for the surgical procedure. The patients were also informed of the likelihood of conversion to OC. The preoperative work up of the study population involved detailed history taking, clinical examination, laboratory investigations and ultrasound of abdomen.

Preoperative history taking protocol included age of the patient in years, gender, whether the patient had acute cholecystitis, multiple attacks of acute pancreatitis in past, gallstone pancreatitis, H/O previous upper abdominal surgery, post ERCP with CBD stenting. Preoperative clinical examination protocol included recording of body mass index (BMI), whether gallbladder was palpable per abdominally and if tenderness was present in the right hypochondrium. Transabdominal ultrasound was done routinely in the preoperative work up to assess number and size of gallstones in gallbladder, if the gallstones were impacted in gallbladder lumen, if the gallbladder was contracted, the thickness of gallbladder wall >4 mm, wall echo sign and to asses for pericholycystic fluid.

The standardized 4-port technique (2 × 10 mm, 2 × 5 mm) of laparoscopic cholecystectomy is used; the patient and operating team being positioned in the American style. Monopolar electrocautery is used as the haemostatic modality. Pneumoperitoneum was created with carbon dioxide by using veress needle. Considering previous studies from the published literatures

Laparoscopic cholecystectomy is considered as difficult if any of the following 4 criteria is fulfilled during the

surgery:-

1. Time taken from skin incision to skin closure more than 90 minutes.
2. Time taken for Callot's triangle dissection more than 20 minutes
3. Time taken for Gall bladder dissection from gall bladder fossa more than 20 minute.
4. Conversion to open cholecystectomy due to any reason.

Data collected in proforma is transferred into MS Excel sheet for further processing and analysis. Data is further analyzed using statistical software Epi info version 4 and SPSS version 20. Qualitative variables are expressed in term of frequencies, proportion and 95% Confidence Interval while quantitative variables are expressed as mean and standard deviation. In order to compare results between two study groups appropriate parametric ornon parametric test of statistical significance are used. Probability value (p-value) less than 0.05 are considered statistically significant.

III. Results

The study included a total patients with age ranging from 10 years to 78 years with mean age 46.69 +/_ SD 13.79 years. The maximum incidence (30%) was seen in the age group of 51 to 60 years (Figure 1) and maximum difficulty was seen in age group 41-50 (48.3%). There were a higher proportion of females (71%).

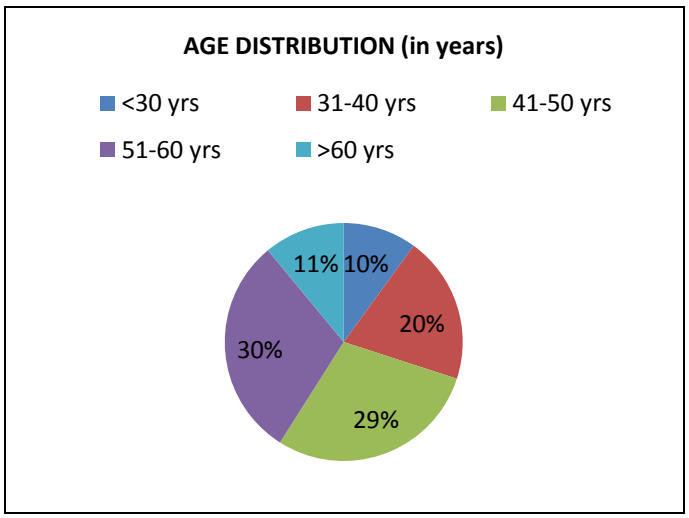

Figure 1:- Age Distribution

In our study 10 patients were operated during acute attack of cholecysttis and 3 out of them faced difficulty in LC and did not showed any significant correlation with difficult cholecystectomy. Multiple attacks of acute cholecystitis was present in 63 patient and 25 (39.7%) showed difficulty. H/O previous upper abdominal surgery was present in 10 patients and 7 (70%) had difficult cholecystectomy and was aso reason for conversion. 12 patients had the history of ERCP with CBD stenting and 10 patients had difficult LC. On clinical examination 27 patients had BMI >25 and 7 patients encountered difficulty and 20 LC was easy. Patients with the tenderness in right hypochondrium was present in 7 patients and 5 patents showed significant difficulty while performing LC and was also reason for conversion. On clinical examination palpable Gall bladder was present in 14 patients and was statistically significant for difficult cholecystectomy.

On sonological examination contracted gall bladder was present in 37 patients and out of these 64 %(24 patients had difficult cholecystectomy, distended gall bladder was present in 16 patients and was also a strong predictor for difficult cholecystectomy and 11 patient had difficult cholecystectomy. In acute attack of cholecystitis gallbladder was found inflamed in 6 cases on USG and 5 patients associated with difficult cholecystectomy. Wall echo sign was seen in 14 patients on USG and only 4 patients had difficult cholecystectomy and 10 patients had easy cholecystectomy. Gallbladder studded with multiple stone was present in 79 patients and out of these 30 LC was difficult to perform whereas big impacted stone ant neck of gall bladder was present in 24 patients, out of these patients 17 LC found to be difficult. Thick wall GB i.e. GB wall thickness >4 mm was found on 15 cases and out of these cases, 13 LC was difficult. pericholecystic fluid was present in 6 patients and, 4 LC was easy and only 2 were found to be difficult. Predictive association between risk factors and intraoperative outcome with statistical analysis is depicted in table 2.

Table2 :- Predative association between risk factors and intraoperative outcome

Predictors			Essy cholecystectomy	Difficult cholecystectomy	Total	*p value*
Clinical	Age	<30	10 (100%)	0 (0%)	10	0.004
		31-40yrs	19 (94.95%)	1 (5.05%)	20	
		41-50 yrs	15 (51.7%)	14 (48.3%)	29	
		51-60yrs	18 (60.0%)	12 (40.0%)	30	
		>60 yrs	7 (63.6%)	4 (36.4%)	11	
	Gender	Female	55 (75.44%)	18 (24.66%)	73	0.03
		Male	14 (41.85%)	13 (48.15%)	27	
	Acute cholecystitis	Yes	7 (70.0%)	3 (30%)	10	1.00
		No	62 (68.8%)	28 (31.2%)	90	
	Multiple attacks	Yes	38 (60.3%)	25 (39.7%)	63	0.015
		No	31 (83.8%)	6 (16.2%)	37	
	Previous abdominal sugery	Yes	3 (30%)	7 (70.0%)	10	0.019
		No	66 (73.3%)	24 (26.7%)	90	
	ERCP with Stenting	Yes	2 (16.67 %)	10 (83.33%)	12	0.01
		No	67 (83.34%)	21 (16.66%)	88	
	BMI	>25	20 (74.1%)	7 (25.9%)	27	0.629
		<25	49 (67.1%)	24 (32.9%)	73	
	Tenderness in RHC	Yes	2 (28.6%)	5 (71.4%)	7	0.02
		No	67 (72.1%)	26 (27.9%)	93	
	Palpable Gall Bladder	Yes	3 (21.4%)	11 (78.6%)	14	0.01
		No	66 (76.7%)	20 (23.3%)	86	
Sonological predictors	Contracted GB	Yes	13 (35.1%)	24 (64.9%)	37	0.01
		No	56 (64.9%)	7 (11.1%)	63	
	Distended GB	Yes	5 (31.3%)	11 (68.7%)	16	0.01
		No	64 (76.2%)	20 (23.8%)	84	
	Inflamed GB	Yes	1 (16.7 %)	5 (83.3%)	6	0.01
		No	68 (70.2%)	26 (29.8%)	94	
	Wall Echo Sign	Yes	10 (71.4%)	4 (28.6%)	14	0.005
		No	61 (70.9%)	25 (29.1)	86	
	Multiple stones	Yes	49 (62.0%)	30 (38.0%)	79	0.003
		No	20 (95.2%)	1 (4.8%)	21	
	Impacted Sone	Yes	7 (29.2%)	17 (70.8%)	24	0.001
		No	62 (81.6%)	14 (18.4%)	76	
	GB wall thickness >4 mm	Yes	2 (13.3%)	13 (86.7%)	15	0.001
		No	67 (78.2%)	18 (21.2%)	85	
	Pericholecystic fluid	Yes	4 (66.7%)	2 (33.3%)	6	1.000
		No	65 (69.1%)	29 (30.9%)	94	

IV. Discussion

In the present study, patient's ranges from 10-78 years with mean age of 46.69 years which is similar to Randhava et al.[10] Elderly patients has become difficult predictor similar to other studies. 14 (48.3%) out of 29 patients had difficult cholecystectomy. Male gender has been also found as difficulty predictor in our study, 13 (48.15%) out of 27 were found difficult, similar to Kama NA et al. [11] this study also demonstrated difficult LC in 7 (70%) out of 10 patients having history of abdominal surgery, similar to Hayama et al and others.[12,13] In this study, 29 (39.7%) out 67 patients with multiple attacks, similar to Nodoni et al.[13] This study also revealed prominently patients with previous ERCP with CBD stent had difficult LC. 10 (83.33%) out of 12 patients had difficulty and even conversion to open cholecystectomy in 2 patients. Another predictive factor for difficult LC was clinically palpable GB due to impacted stone in the Hartman pouch, 11 (78.6%) out of 14 were had difficult cholecystectomy similar to Randhava et al. and Agrawal et al.[10,14] Similarly 24(64%) out of 37 of contracted and fibrosed GB found difficult associated with difficulty in dissection at Calot's triangle and separation fron GB bed and final extraction. Similar to [9,15,16,17] This study also observed that distended GB 11(68.7%) out of 14 which was also clinically palpable were found difficult, similar to Singh et al study.[18] though 16 patients had distended GB out of which 14 were palpable. Thick wall GB >4 mm 13 (86.7%) out of 15 were found difficult similar to Mohanty SK et al.[19]

Other observation like acute cholecystitis, obesity and pericholecystic fluid did not found any association.

V. Conclusion

Laparoscopic cholecystectomy being established as a gold standard for heavy population presented with symptomatic cholelithiasis, it is utmost important to prepare before hand for difficulty in procedure, avoid complications and legal aspect attached with it.

In our study of 100 patients, preoperative prediction of difficult laparoscopic cholecystectomy was made in 31 patients. We observed that preoperative factors such as elderly age >40 yrs. Male sex, previous history of multiple attacks of acute cholecystitis, h/o ERCP with CBD stenting, Upper abdominal surgery, clinically tender palpable GB, USG evidence of contracted/distended GB, impacted stone at GB neck, GB wall thickness >4 mm, multiple stones in GB, USG evidence of GB were found statistically significant in predicting difficult laparoscopic cholecystectomy. Difficulty in male sex were observed in 11 out of 14 patients i.e. 78.0% in this study supported the more tolerance for the multiple attacks thereby making a LC difficult

1. In the present study, most important predictive factor for difficult LC was ERCP with CBD stent of the rate of 83.33%, meaning thereby 10 patients with difficult LC out of total 12 patients of ERCP with CBD stent.
2. Impacted stone at neck of the GB was another important predictive factor found in this study of the rate of 78.8% meaning thereby 17 patients had difficult LC out of total 24 patients with impacted stone at GB neck.
3. This study also showed that conversion to open cholecystectomy in 11 pt out of total 31 was due to 2 patient of ERCP with CBD stent and 10 with impacted stone at neck and 1 one of them having both ERCP stenting as well as impacted stone at neck.
4. Another feature of the study was clinically palpable GB was also predicted as an important factor for difficulty in LC by the rate of 78.0% meaning thereby 11 patient were difficult out of total 14 pt of palpable GB mostly due to impacted stones.
5. During per abdomen examination tenderness in RHC which was observed in 7 patients, out of these 5 (71.4%) patients showed difficulty during LC therefore, it turned out to be a important predictive factor for difficult laparoscopic cholecystectomy

However, in our study, there were multiple factors predicting difficult cholecystectomy were present in few patients thereby making LC even more difficult due to their compounding effect. Hence, compounding effect of multiple predicting factors must be considered for high suspicion of difficult cholecystectomy and an experienced team should be arranged to tackle with the difficulties before planning surgery and patient should be counseled accordingly before surgery to avoid legal consequences.

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