

ORIGINAL RESEARCH**Factors predicting the operative difficulty in Laparoscopic cholecystectomy: An observational study**¹Hemant Kumar Gupta, ²Vijay Kumar Goel, ³Neharika¹Junior Resident, ²Professor, ³Assistant Professor, Department of General Surgery, Hind Institute of Medical sciences, Barabanki, Uttar Pradesh, India**Correspondence:**

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Email: neharika_snh@yahoo.com**ABSTRACT**

Background: Laparoscopic cholecystectomy is minimally invasive surgery done for removal of diseased gall bladder and considered as gold standard. It is the commonest general surgical procedures done worldwide.

Methodology: An observational study done in Hind Institute of medical Sciences, Barabanki. from June 2017 to June 2021 during which patients admitted with the plan of laparoscopic cholecystectomy were preoperatively evaluated clinically, biochemically and radiologically. LC was performed by standard 4 port technique was under GA by qualified surgeon and well-trained team. Surgery was categorised into easy, difficult and very difficult depending on the duration of surgery. Preoperative factors were then analysed and compared with the operative difficulty.

Result: A total of 300 patient underwent LC in which 71.7% were females. Mean age of patients was 41.36±13.68 years with 31.3% patients between 41-49 years. Recurrent abdominal pain was observed in 38.3% and 4.3% patient had history of biliary pancreatitis. Ultrasonologically, single stone was observed in 62% whereas thickened GB wall was observed in 33%. Serum ALP was elevated in 2.3 % whereas 2.7% had leucocytosis. Operative ease was encountered in 40% consuming < 60 minutes, whereas 56.7% was difficult (60-120 mins) and 3.3 % were very difficult (>120 mins). Conversion rate was 1.65%, all from very difficult category. Age 40-49 years, solitary GB calculus, GB wall thickness > 4mm, leucocytosis and history of pancreatitis has statistically significant correlation with difficult cholecystectomy but no such association was observed with gender, elevated serum ALP and comorbidities.

Conclusion: Difficult LC was observed in 60% patients. Age between 41-50 years, solitary GB calculus and thickened GB wall (>4mm) with a attack of pancreatitis can be considered as predictor for difficult cholecystectomy.

Keywords: Gall stone disease, Cholelithiasis, Cholecystitis, Laparoscopic cholecystectomy, Difficult cholecystectomy, ultrasonography

INTRODUCTION

Laparoscopic cholecystectomy is an effective and safe modality of treatment for patients with symptomatic gallbladder stone disease and is considered as gold standard [1]. Cholelithiasis affects 3 to 20 % of the people living across the world that is around 4% in India, which makes LC the commonest general surgical procedure performed worldwide [2, 3]. Most of the gallstones remain asymptomatic while some shows symptoms like biliary colic, nausea,

vomiting, jaundice and fever. Abdominal pain and post prandial dyspepsia remain the commonest presentation [3,4,5]. Laparoscopic cholecystectomy is also one of the first laparoscopic surgery performed by the surgical residents. [6]

In the era of minimal access Surgery, LC is considered as a day care procedure [7] hence it is the surgeon responsibility to ensure surgical safety and feasibility. Irrespective of the increasing surgeon's expertise and newer advance laparoscopic instruments, LC still accounts for dreaded complications like bile duct injury ranging from 0.2 – 0.5% and at times dreaded bowel and vascular injury [8] that may need conversion to open procedure.

Ultrasonography of abdomen is considered as imaging of choice for diagnosing cholelithiasis with 90-95% accuracy. [9]

Anticipating intra operative difficulty using preoperative factor helps in better preparedness of surgical team in context to complication and conversion rate and its management. Accordingly, patient can be counselled for relatively high risk of complication, chances of conversion, longer hospital stay and cost of treatment [10,11].

Aim of the study: To study pre operative factors predicting operative difficulty in laparoscopic cholecystectomy.

MATERIAL AND METHOD

An observational study was carried out in Dept of General Surgery, Hind institute of medical sciences Barabanki, from a period of June 2017 to June 2021 in which all patient planned for laparoscopic cholecystectomy for symptomatic GSD were included in the study. Exclusion criteria were age less than 18 years, GB perforation, suspected carcinoma GB and non-consenting patients. Patients were admitted a day prior to surgery and detail history and physical examination was performed and recorded as per study proforma. Biochemical tests including complete blood count, liver function test, random blood sugar, renal function test was done and reports were analysed for any abnormality. Ultrasonography of abdomen was done by senior radiologist in all cases and details such as GB wall thickness, number of calculus or sludge, pericholecystic fluid and CBD status were noted in particular.

CECT abdomen and MRCP was performed in selected patient showing need of further evaluation based on ultrasonological finding and altered Liver function test. ERCP was performed in patients who needed CBD clearance.

After Anaesthetic clearance and informed consent, patients were taken up for Surgery, which was performed by qualified General Surgeons and assisted by trained surgical residents of the department. Standard 4 port technique with two 10 mm and two 5 mm ports were used for all cases.

All surgery were performed under General Anaesthesia, prophylactic antibiotic was given 30 minutes prior to skin incision. Intraoperative details were noted about gall bladder status, pericholecystic adhesion, Calot's triangle status, any anatomical variations and duration of surgery. Operative difficulties were classified and studied in the following steps during the procedure: 1) Creation of pneumoperitoneum. 2) Separation of intraperitoneal adhesion. 3) Calot's triangle dissection- attaining Critical View of safety. 4) Removal of gall bladder from liver bed. 5) Extraction of gallbladder from epigastric port.

Total duration of surgery (from skin incision to port closure) was used to categorize the operative difficulty into easy, difficult and very difficult cholecystectomy. Duration of surgery less than 60 minutes was considered easy LC whereas surgery which exceeded more than 60 minutes duration were considered difficult laparoscopic cholecystectomy and those exceeding 120 minutes duration were considered very difficult laparoscopic cholecystectomy. All GB specimen was sent for histopathological examination. Standard postoperative care was given in the surgical ward following ERAS protocol.

Intraoperative difficulty was compared with preoperative factors for any statistically significant correlation. All data collected on pre-designed proforma and transferred on Excel sheet. Statistical analysis done using SPSS-16 data analysis software & Chi square test.

RESULTS

Total of 300 patient fulfilling inclusion criteria were enrolled in the study and underwent Laparoscopic cholecystectomy as per standard protocol.

We observed that the mean age of the patients was 41.36 ± 13.68 years ranging from 20-75 years. Maximum cases were from age group 40-49 years (31.3%) followed by 24.7% from age group 20-29 yr. Out of 300 patients, 215 (71.7%) were females and rest 85 (28.3%) cases were males. History of recurrent attack of cholecystitis was there in 115 (38.3%) patients while remaining 185 (61.7%) cases had other symptom complex like dyspepsia, nausea and post prandial fullness. History of Biliary Pancreatitis was there in 13 (4.3%) cases. [Table No. 1]

The comorbidities observed in study cases were hypertension (HTN) in 2.7%, diabetes mellitus (DM) in 4.3%, chronic liver disease (CLD) in 1.0% and coronary artery disease (CAD) in 0.7%.

Based on Ultrasonological features, GB wall was noted thick (> 4mm) in 33.0% of the cases while it was normal in 67.0%. Single GB stone was found in 62.0% cases whereas multiple gallbladder stone found in 38.0% cases.

Based on biochemical profile, leucocytosis was detected in 2.7% cases whereas it was within normal range in remaining 97.3%. The Serum Alkaline Phosphatase level were raised (>144 IU/L) in 2.3% cases while in 97.7% cases it was within normal limit.

For assessing operative difficulty, total duration of Surgery was observed less than 60 minutes in 40% cases whereas 56.7% surgery got completed in 60-120 mins and more than 120 min was needed to complete surgery in 3.3% cases.

So, we encountered difficult cholecystectomy in 180 out of 300 surgeries performed that is 60%. Multiple causes for intra operative difficulty were noted which has been tabulated in table No. 3. In which Acute Cholecystitis in 36.7%, pericholecystic adhesion in 13.3%, contracted/Fibrosed GB in 13.9%, Impacted stone at GB neck in 19.4% whereas 22.2% patients had intra-hepatic GB, frozen calot's triangle was found in 3.3% patients, dense fat at calot's triangle in 5.6% patients, anatomical variation was encountered in 5 patients (2.8%) and 5 (2.8%) patients had difficult fundus retraction due to liver adhesion. Whereas technical difficulties (creating pneumoperitoneum) were encountered in 10 patients (5.6%).

Considering that attaining critical view of safety is the most important step for a safe LC, operative note was taken for duration for calots dissection which was observed to be longer than 30 min in 34% cases whereas in 66% patients calot's triangle dissection was completed within 30 mins. In above 34% (102) patients, the causes observed for prolonged duration for calot dissection were Contracted/Fibrosed GB (21.6%), Acute Cholecystitis (22.5%), Impacted stone at neck (24.5%), Dense fat at calot's (3.9%), Frozen calots (3.9%) and Anatomical Variation (4.9%).

Gall bladder dissection from liver bed was difficult in 19 (6.3%) patients which was mainly due to intrahepatic gall bladder. All GB specimen were extracted from epigastric port.

Conversion from laparoscopic to open cholecystectomy was needed in 5 out of 300 patients which was 1.65%, and all of them were from very difficult LC category.

The drain placement was needed in 15 (5%) cases where there were either significant biliary spillage or bleeding, while in remaining 285 (95%) cases it was not needed.

Among the post op complication shown in the study, port site infection was noted in 7 (2.3%) cases while evidence of bleeding in drain in 3 (1.0%) cases which was managed conservatively and there is no evidence of bile leak in drain.

After analysing the data, we observed that the age of the patient was found to be significantly associated with the difficulty of LC ($p=0.001$). Most of the very difficult and difficult cases fall in the age group 40-49 year which was 80% and 31.8% respectively. But no significant association of difficulty was found with the gender ($p=0.556$) or comorbidities of the patients like Hypertension ($p=0.201$), Diabetes Mellitus ($p=0.772$), Chronic Liver Disease ($p=0.314$) and coronary artery disease ($p=0.463$). [Table no. 4]

The ultrasonological Gall bladder characteristics that showed statistically significant association with the difficult LC was solitary GB calculus ($p=0.006$) and increased GB wall thickness ($p=0.047$). There was no significant association found with elevated serum alkaline phosphatase with the difficulty ($p=0.065$). The high WBC count was found to be significantly associated with the difficulty ($p=0.034$).

History of pancreatitis was found to be significantly associated with the difficulty ($p=0.031$).

DISCUSSION

In our study on 300 patients undergoing LC, we observed that majority of the surgery performed was on female patients (71.7%) which was also observed by Bansal A et al [12] and Shukla A et al [13] who had 65% and 82% female patients in their respective studies. Mean age of patient in our study was 41.36 ± 13.68 years which was similar to Bansal A et al [12] and Shukla A et al [13] which was 50 and 41.3 respectively. Maximum patients (31.3%) were from the age group 40-49 years, which was also suggested in the study done by Shaffer EA et al [14] according to which frequency of gall stones escalate markedly after the age of 40.

In our study patients, 38.3% patients had history of acute cholecystitis and 4.3% patients had biliary pancreatitis which was less as compared to study done by B.R. Ghadhban on 100 patients in which 63% patient had cholecystitis and 7% had pancreatitis. [11]

Difficult LC was encountered in 60% of the patients in which 3.3% were very difficult while 1.65% patient needed conversion to open cholecystectomy for safe completion of surgery. Similar result was seen in the study done by BR Ghadhban [11] where 55% difficult LC were reported but lesser difficult LC (33%) was encountered by Marc G et al [15]. Causes of intraoperative difficulty noted by us includes acute cholecystitis (36.7%), intrahepatic GB (22.2%), impacted stone at GB neck (19.4%), pericholecystic adhesion (13.3%) and severely contracted or fibrosed GB (13.3%) which was similar to observation made by Singh K et al in which acutely inflamed GB was commonest followed by contracted GB [16]. Whereas Ahmed ML et al observed pericholecystic adhesion to be commonest cause of intraoperative difficulty. [17]

In our study, it was observed that age of the patient between 40-49 years, presence of leucocytosis, ultrasonologically detected thick GB wall, solitary GB calculus and history of biliary pancreatitis are strong predictors for difficult LC as statistically significant association was seen (p value < 0.05). Our study supports finding observed by BR Ghadhban [9], Agrawal S et al [18] and Dinkel et al [19] that suggested gall bladder wall thickness is a strong indicator of technical difficulties along with impacted GB neck stone. Marc G et al also considered biliary pancreatitis as a factor affecting difficult and complicated LC [15]. We could not find any association with factors such as gender, comorbidities, high serum alkaline phosphatase unlike study done by BR Ghadhban [11] where male gender and Diabetic patients had significant association with difficulty.

Hence our study focusses on limited number of preoperative factors which can be studied feasibly and will help surgeon in anticipating operative difficulty for better preparedness for conversion as well as complication and its management.

CONCLUSION

Symptomatic cholelithiasis patient with factor such as age above 40 years, history of acute pancreatitis, leucocytosis, thickened GB wall on Ultrasonography and solitary GB calculus can be used as a predictor of difficult laparoscopic cholecystectomy.

Ethical approval

Approval was taken from the Institutional Ethical Committee. Consent was taken from the patient for involving in the study.

Conflict of Interest- There is no conflict of interest

Table No. 1: Patient distribution based on pre operative clinical, biochemical and radiological factors

Patients Characteristic	Number (N=300)	Percentage(%)	
Age (years)			Mean±SD 41.36±13.68
20 - 29	74	24.7	
30 - 39	50	16.7	
40 - 49	94	31.3	
50 - 59	47	15.7	
>= 60	35	11.7	
Gender			
Male	85	28.3	
Female	215	71.7	
Recurrent abdominal pain			
Yes	115	38.3	
No	185	61.7	
Biliary Pancreatitis			
Yes	13	4.3	
No	287	95.7	
Co-morbidities			
HTN	08	2.7	
DM	13	4.3	
CLD	03	1.0	
CAD	02	0.7	
Ultrasound Abdomen			
GB wall thickness			
>4mm	201	67	
<4mm	99	33	
Number of stones			
Single	186	62	
Multiple			
Sr ALP (IU/L)			
>144	07	2.3	
<144	293	97.7	
TLC (counts/cu mm)			
>11,000	08	2.7	
<11,000	292	97.3	

HTN- Hypertension, DM- Diabetes Mellitus, CLD- Chronic liver disease, CAD- Coronary arterial disease, Sr ALP- serum alkaline phosphatase, TLC- total leucocyte count

Table No. 2: Categorization of operative difficulty level based on total duration of surgery

Total Duration of Surgery in minutes (Skin incision to port closure)	No. (N=300)	Percentage (%)
Easy(<60)	120	40
Difficult (60-120)	170	56.7
Very difficult (>120)	10	3.3

Table No. 3: Distribution of causes of Intraoperative difficulty

Causes	No. (N=180)	Percentage(%)
Acute cholecystitis	66	36.7
Pericholecystic Adhesion	24	13.3
Contracted/Fibrosed GB	25	13.9
Impacted GB neck stone	35	19.4
Intrahepatic GB	40	22.2
Frozen calot's triangle	06	3.3
Fatty calot's triangle	10	5.6
Anatomical variation	05	2.8
Difficult fundus retraction due to liver adhesion	05	2.8
Technical difficulties (creating pneumoperitoneum)	10	5.6

Table-4: Association of demographic and clinical variables with Difficulty

Variables	Difficulty						chisq.	p-value
	Easy(<60min) (N=120)		Difficult(60-120min) (N=170)		Very Difficult(>120 min)(N=10)			
	No.	%	No.	%	No.	%		
Age								
20-29yr	39	32.5%	35	20.6%	0	0.0%	28.67	0.001
30-39yr	19	15.8%	30	17.6%	1	10.0%		
40-49yr	32	26.7%	54	31.8%	8	80.0%		
50-59yr	24	20.0%	23	13.5%	0	0.0%		
>=60yr	6	5.0%	28	16.5%	1	10.0%		
Sex								
Male	38	31.7%	44	25.9%	3	30.0%	1.17	0.556
Female	82	68.3%	126	74.1%	7	70.0%		
No. of GBS								
SingleGBS (N=186)	87	72.5%	92	54.1%	7	70.0%	10.37	0.006
MultipleGBS(N=114)	33	27.5%	78	45.9%	3	30.0%		
GB wall								
Normal (N=191)	85	70.8%	108	63.5%	8	80.0%	9.65	0.047
Thick (N=99)	35	29.2%	62	36.5%	2	20.0%		
S. alkaline phosphatase								
>144 IU/L	0	0.0%	7	4.1%	0	0.0%	5.48	0.065
<144 IU/L	120	100.0%	163	95.9%	10	100.0%		

WBC count								6.74	0.034
>11,000	0	0.0%	7	4.1%	1	10.0%			
<11,000	120	100.0%	163	95.9%	9	90.0%			
Pancreatitis diagnosis								6.95	0.031
No(N=287)	117	97.5%	162	95.3%	8	80.0%			
Yes(N=13)	3	2.5%	8	4.7%	2	20.0%			

Table-5: Association of Comorbidities with Difficulty

Comorbidity	Difficulty						chisq	p-value
	Easy (<60min)		Difficult(60-120min)		Very Difficult(>120 min)			
	No.	%	No.	%	No.	%		
HTN	1	.8%	7	4.1%	0	0.0%	3.21	0.201
DM	5	4.2%	8	4.7%	0	0.0%	0.52	0.772
CLD	0	0.0%	3	1.8%	0	0.0%	2.32	0.314
CAD	0	0.0%	2	1.2%	0	0.0%	1.54	0.463

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