



EVALUATION OF CLINICO-RADIOLOGICAL FACTORS PREDICTING DIFFICULT LAPAROSCOPIC CHOLECYSTECTOMY

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ABSTRACT **Introduction:** Laparoscopic cholecystectomy has become procedure of choice for treatment of symptomatic gallstone disease [1]. Even though it is a safe procedure occasionally it can be difficult and requires conversion to open cholecystectomy for various problems faced during surgery. Preoperative prediction of difficult laparoscopic cholecystectomy and likelihood of conversion to open cholecystectomy will avoid such complications and overall cost of treatment.

Aim: To evaluate the clinico-radiological factors predicting difficult laparoscopic cholecystectomy

Methods: This was a prospective study conducted from October 2018 to November 2020. Total of 101 patients meeting inclusion criteria undergoing laparoscopic cholecystectomy were included in the study. Various clinical, radiological and biochemical parameters and intra-operative difficulties during surgery were recorded. The statistical analysis was done using chi-square test and ANOVA test.

Results: The parameters such as sex, age, duration of disease, co-morbid disease, previous history of cholecystitis, palpable gall bladder, BMI, TLC, thickness of gall bladder, largest stone size and impacted stone are found statistically significant in predicting difficult laparoscopic cholecystectomy and conversion to open cholecystectomy preoperatively.

Conclusion: Difficult laparoscopic cholecystectomy may be predicted preoperatively even with a good clinical judgement whereas both clinical and radiological parameters provide a better preoperative prediction of difficult cholecystectomy so that the surgeon can be prepared in advance for the complications.

KEYWORDS : Body Mass Index, Acute Cholecystitis, Laparoscopic cholecystectomy, Gallstone disease, Open cholecystectomy

INTRODUCTION

Gallstone disease is one of the most common problems affecting digestive tract. It is estimated that approximately 20 million people in United States have gallstones and that approximately 1 million new cases of cholelithiasis develop each year. [2]

In India the prevalence is estimated to be around 4% mainly attributed to westernization of diet, change in socio-economic structure and availability of ultrasound as investigation in both urban and rural areas. [2]

The National Institute of Health (1992) stated that laparoscopic cholecystectomy provides a safe and effective treatment for patients with symptomatic gallstones. [3]

Following the advent of laparoscopic cholecystectomy with its accompanying smaller incisions, less pain, better cosmesis, earlier return of bowel function, shorter hospitalization and earlier return of full activity, surgeons have performed a large number of laparoscopic cholecystectomies. [4] Currently around 80% of cholecystectomies are performed using laparoscopic approach. [5]



Fig.1 Gall bladder seen during laparoscopic cholecystectomy

The rate of conversion from laparoscopic cholecystectomy to open cholecystectomy is 5-10%. [6] With increasing experience, laparoscopic cholecystectomy is being used even in situations that were earlier contraindicated (acute cholecystitis, morbid obesity, previous upper abdominal surgery). [7] In such conditions a lot of problems can be avoided by correct preoperative prediction of difficult

laparoscopic cholecystectomy so that specialized instrumentations, expertise of senior surgeon or if required referral to higher center maybe arranged on time, thus avoiding unnecessary complications and overall expenses of patient.

This study is done to identify the clinical and radiological predictors of difficult laparoscopic cholecystectomy preoperatively.

METHODS

This prospective study was conducted at Jawaharlal Nehru Medical College and Hospital, Aligarh, Uttar Pradesh. 101 patients undergoing laparoscopic cholecystectomy for gallstone disease confirmed by ultrasonography during October 2018 to November 2020 were included. Patients less than 14 years, abdominal malignancy, jaundice, CBD stone, acalculous cholecystitis and those not willing to be part of study were excluded. Study protocol was approved by institutional committee.

Various clinico-radiological parameters were assessed such as age, sex, BMI, previous history of surgery, previous history of acute cholecystitis, duration of disease, previous ERCP, co-morbid diseases, palpable gall bladder, TLC, thickness of gall bladder wall, size of gall bladder, gall bladder polyp, number of gall bladder stones, size of largest stone, impacted stone, status of CBD and pericholecystic fluid collection. The intraoperative findings were noted such as difficulty in port insertion, identification of gall bladder, grasping of gall bladder, Calot's triangle dissection, duct clipping, dissection of gall bladder from liver bed and extraction of gall bladder.

All the clinic-radiological parameters were compared to difficult laparoscopic cholecystectomy given by Randhwana et al. [8]

Easy cholecystectomy: Time taken for surgery is less than 60 mins, no bile spillage, no injury to duct or artery.

Difficult cholecystectomy:

Time taken for surgery is 60 to 120 mins, bile or stone spillage or injury to duct present.

Very difficult cholecystectomy:

Time taken for surgery is more than 120 mins or conversion to open cholecystectomy.

Time was calculated from veress needle insertion till port closure.

All surgeries were done under general anaesthesia by standard four port technique, carbon dioxide pneumoperitoneum at 12mmHg was used.

STATISTICAL ANALYSIS

Data recording was done in predesigned proforma. All the data was entered in Microsoft Excel. Statistical analysis was done by using SPSS software. P-value <0.05 was taken as significant.

RESULTS

In our study majority of the patients were of age group 21-40 years (50 out of 101). The mean age of the patients having gallstone disease is 39.53 years±14.12 years.

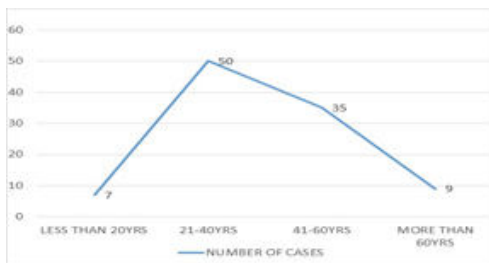


Fig. 1: Bar diagram showing age distribution of gallstone disease

Out of 101 patients, 73 were females and 28 were male patients. The male to female ratio is 1:2.6

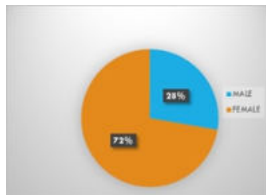


Fig. 2: Pie diagram showing sex wise distribution of gallstone disease

Clinical presentation

Pain was the presenting complaint of 100% patients.

Table 1: Showing distribution of various symptoms among patients

Symptoms	Number of cases	Percentage
Pain in abdomen	101	100%
Fever	5	4.95%
Vomiting	7	6.93%
Nausea	1	0.99%

Maximum number of patients lies in the BMI group 23-24.99 kg/m² i.e. 39 patients

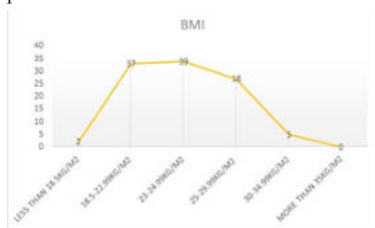


Fig. 3: Bar diagram showing BMI distribution among patients

Most of the patients had symptoms of 0-3 months i.e. 44 patients (43.56%) and only 6 patients (5.94%) had symptoms for more than 12 months. Mean duration of symptoms was 169.01 days.

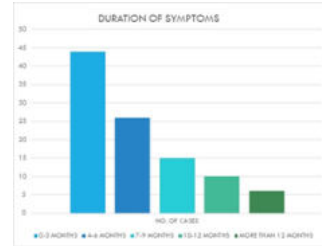


Fig. 4: Bar diagram showing distribution of patient on the basis of duration of symptoms

Previous history of abdominal surgery was present in 9 patients (8.91%)

Previous history suggestive of acute cholecystitis was present in 11 patients (10.89%).

There was only one patient with previous history of ERCP(0.99%)

There were maximum patients of hypertension as co-morbid disease associated with gallstone disease i.e. 8 patients (7.92%).

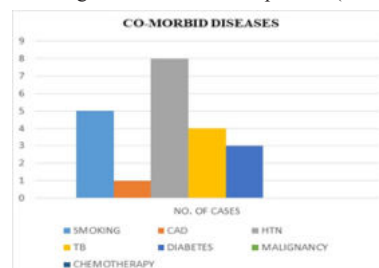


Fig. 5: Bar diagram showing various co-morbid diseases present among patients

There were only 10 patients in which gall bladder was palpable (9.9%) There are only 11 patients with TLC more than 11000/mm³ (10.89%)

There were 75 patients (74.25%) with gall bladder size less than 4cm and 26 patients (25.74%) patients with gall bladder size more than 4cm

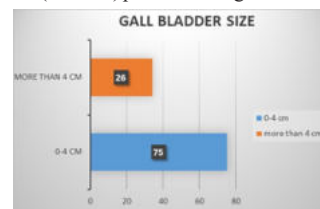


Fig. 6: Clustered bar diagram of distribution on basis of gall bladder size

There are only 10 patients (9.9%) with gall bladder wall thickness more than 3mm rest of the patients had gall bladder wall thickness 0-3mm.

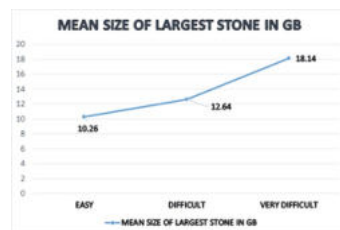


Fig. 7: Line diagram showing mean size of largest stone found in various types of laparoscopic cholecystectomy

There were 58 patients (57.42%) with multiple gall bladder stones and 43 patients (42.57%) with single gall bladder stone.

There were 8 patients (7.92%) with impacted stones and only one patient (0.99%) with pericholecystic fluid.

There were no gall bladder polyp present in any of the patients.

CBD was normal in all the patients on ultrasonography

In our study 65 patients (65.35%) were operated within 60 minutes. There were 29 patients (28.71%) who were operated in 60 to 120 minutes and 7 patients (6.93%) were operated in more than 120 min.

There were 39 patients (38.61%) in whom gall bladder adhesions with the surrounding structures were present.

There were 19 patients in whom bile spillage was present. There were no patient of bile duct or any other organ injury.

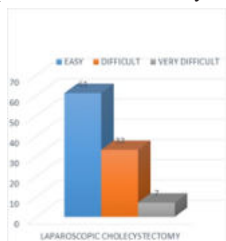


Fig. 8: Column diagram showing distribution of patients on the basis of difficulty of laparoscopic cholecystectomy.

Table 2: showing distribution of patients undergone additional technique use during the surgery

ADDITIONAL TECHNIQUE	NO. OF CASES	PERCENTAGE
Difficulty in port placement	7	6.93%
Aspiration of GB content	10	9.90%
Extraction of GB in sterile bag	4	3.96%
Use of additional port	0	0%
Enlargement of epigastric port	11	10.89%
Conversion from LC to OC	4	3.96%

Table 3: showing distribution of various parameters in different types of laparoscopic cholecystectomy.

PARAMETERS	EASY LC	DIFFICULT LC	VERY DIFFICULT LC	p-value
Number of cases	61	33	7	-
Mean age (years)	36.88	43.17	43.71	0.08
Mean duration of symptoms (days)	106.61	243.14	304.29	0.001
Number of males	11 (10.89%)	13 (12.87%)	4 (3.9%)	0.022
Number of females	48 (47.52%)	22 (21.78%)	3 (2.97%)	-
Mean BMI (kg/m ²)	22.14	24.50	28.10	0.001
Cases with co-morbid diseases	5	13	4	0.001
Previous H/O ERCP	0	1	0	0.416
Previous H/O acute cholecystitis	0	8	3	0.001
H/O previous abdominal surgery	5	3	1	0.733
Palpable gall bladder	0	7	3	0.001
Mean TLC (/mm ³)	7575.93	7785.71	11242.86	0.003
Mean gall bladder size (cm)	3.07	4.069	5.25	0.001
No. of gall bladder stones	1 MULTIPLE 21 38	1 MULTIPLE 18 17	1 MULTIPLE 4 3	0.229
Gall bladder wall thickness >3mm	0	7	3	0.03

Pericholecystic fluid	0	1	0	0.416
Mean size of largest stone	10.26mm	12.64mm	18.14mm	0.004
Impacted stone	0	8	2	0.014
Mean duration of surgery (min)	31.06	64.72	127.42	-
Adhesions with surroundings	10	22	7	-
Bile spillage	0	14	5	-
Bile duct injury	0	0	0	-
Mean duration of post op. hospital stay (days)	2.06	3	5.43	-

Mean duration of post-operative hospital stay for easy LC was 2.06 days, for difficult LC was 3 days and for very difficult LC was 5.43 days.

Age (p=0.009), male gender (p=0.012), duration of symptoms (p<0.001), co-morbid condition (p<0.001), previous history of acute cholecystitis (p<0.001), palpable gall bladder (p<0.001), BMI (p<0.001), TLC (p=0.003), thickness of gall bladder (p=0.001), size of gall bladder (p<0.001), largest stone size (p<0.001) and impacted stone (p=0.001) were all found statistically significant parameters in predicting preoperatively difficult laparoscopic cholecystectomy.

DISCUSSION

There are studies that have reported age not a significant risk for difficult laparoscopic cholecystectomy (Gupta N. et al⁹ and Acharya et al¹⁰). But in this study, age (p=0.009) had a significant affect in predicting difficult laparoscopic cholecystectomy. This finding is consistent with many previous studies^(11,12,13,14,15,16,17).

In present study there are 77.5% females undergoing laparoscopic cholecystectomy for gallstone disease. Higher incidence of gallstones in females has been suggested due to effect of hormones (oestrogen and progesterone) on biliary cholesterol level and gall bladder motility.^(18,19)

M. Ballal et al¹¹ and others^(12,14,17,20,21,22) found that male gender is a risk factor for difficult laparoscopic cholecystectomy. Authors found same result in this study (p=0.012). Whereas A. K. Gupta et al²³ and Schrenk P. et al²⁴ had not found male as a significant predictor of difficult laparoscopic cholecystectomy.

Ravindra Nidoni et al²⁷ and Ayanat et al²⁸ reported previous history of acute cholecystitis as a significant predictor of difficult laparoscopic cholecystectomy, similar results were found in this study (p<0.001). Acute cholecystitis may lead to increased gall bladder wall thickness, scarring, fibrosis and adhesions around the gall bladder resulting in difficulty during grasping of gall bladder, adhesiolysis, dissection of Calot's triangle and dissection of gall bladder from liver bed.

In previous literature it is assumed that previous abdominal surgery especially upper abdominal surgery may cause difficulty due to periumbilical and peri-gall bladder adhesions. Nachnani et al²⁰ reported that previous abdominal surgery poses problems during creation of pneumoperitoneum and during adhesiolysis to gain exposure to the operative field. But Kanann et al²⁹ and Lipman et al³⁰ did not find prior abdominal surgery as a significant risk factor for prediction of difficult laparoscopic cholecystectomy. In present study also previous history of surgery is not a risk factor for difficult laparoscopic cholecystectomy (p=0.743). Since the number of patients with previous history of surgery was very small and none of them had upper abdominal surgery, no definitive conclusion can be derived regarding this risk factor.

It is found in this study that longer duration of symptoms (p<0.001) is a risk factor for difficult laparoscopic cholecystectomy. As the duration of disease increases there will be repeated attacks of inflammation resulting in adhesions and difficult surgery. This finding is consistent with A. K. Gupta et al²³.

Shrirang V. et al¹⁵ and others^(12,13,20,23,28,31) found that high BMI as a risk factor for difficult laparoscopic cholecystectomy, similar results were found in this study (p<0.001). Abdominal fat is an obvious cause for difficulty in port placement, manoeuvring instruments and extraction

of gall bladder noted during intraoperative period. But Constantinos S. et al³² and U Jethwani et al²¹ had not found BMI as a significant predictor for difficult laparoscopic cholecystectomy.

Jaskiran S. R. et al⁸ and others^[13,15,22] observed that palpable gall bladder as a risk factor for difficult laparoscopic cholecystectomy. During intraoperative period difficulty was found in grasping and extraction of palpable gall bladder. Thus in this study author had found similar result ($p < 0.001$).

In present study comorbid diseases ($p < 0.001$) was found to be a significant risk factor for difficult laparoscopic cholecystectomy, similar observation was noted by Ayanat Hussain et al.

Ravindra N. et al²⁷ and Shrirang V. et al¹⁵ found that TLC > 11000 as a risk factor for difficult laparoscopic cholecystectomy, similar relationship was observed in this study ($p = 0.003$). As it is well known fact that total leucocyte count increases in inflammatory conditions leading more adhesions and fibrosis around the gall bladder and difficult surgery.

It was found that gall bladder wall thickness $> 3\text{mm}$ as a significant predictor of difficult laparoscopic cholecystectomy by Jagdish Nachnani et al²⁰, Syed A. A. Rizvi et al³³, Ravindra Nidoni²⁷ et al and many others. Authors had found same observations in this study ($p = 0.001$). As thickened gall bladder wall is found in inflammation or fibrosis of gall bladder both of it add to the difficult dissection, adhesiolysis and extraction of gall bladder.

Size of gall bladder is another important risk factor in predicting difficulty in laparoscopic cholecystectomy found in this study ($p < 0.001$).

Authors found that largest stone size ($p < 0.001$) as one of the risk factor for difficult laparoscopic cholecystectomy is also consistent with observations in the study done by Sindhu R. et al.¹⁴

This study found that impacted stone ($p = 0.001$) is a significant risk factor for predicting difficult laparoscopic cholecystectomy that is also seen in other studies done by Prashant et al, Shrirang et al¹⁵, N. Veerang et al²², Taghi J. et al³⁴ and Krishan S. et al.¹⁷

According to Mittalgodu et al^[12] previous ERCP is a significant risk factor for predicting difficulty but in our study such relationship was not observed as there was just one case, similar results was found by Mohammad I. et al¹⁶.

Prashant et al, Ravindra Nidoni et al²⁷ and Krishan et al¹⁷ found that pericholecystic fluid collection as a significant factor in prediction of difficult laparoscopic cholecystectomy whereas in this study we did not observed pericholecystic fluid as a risk factor for laparoscopic cholecystectomy. This is consistent with others^[8,35,31].

In our study we found that although conversion to open cholecystectomy was needed in 4 patients (3.96%), there were 33 patients who had difficult laparoscopic cholecystectomy. It is important to predict difficult laparoscopic cholecystectomy preoperatively so that surgeon will be ready beforehand to face problems encountered during surgery. Very difficult cases may be done in advanced laparoscopic surgery centre that is equipped with resources and expertise to handle all types of complications. Patient may also be counselled in advance about that risk of conversion to open cholecystectomy during intraoperative period.

CONCLUSION

Clinico-radiological parameters can predict difficult laparoscopic cholecystectomy preoperatively. The significant risk factors found were age, male gender, duration of disease, co-morbid condition, previous history of acute cholecystitis, palpable gall bladder, BMI, TLC, thickness of gall bladder, size of gall bladder, largest stone size and impacted stone. Preoperative prediction of difficult laparoscopic cholecystectomy can help the surgeon to better prepare for any complications encountered during surgery with expertise, advance equipment, not hesitant to convert to open cholecystectomy when required or give referral to specialized centre when needed.

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