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Analysis of pre-operative factors predicting difficult laparoscopic cholecystectomy

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Abstract---Background: Laparoscopic cholecystectomy is considered the gold standard treatment for most gallbladder diseases. It has now become one of the most common operations performed by general surgeons. At times, it is difficult and takes longer time or some complications may occur or has to be converted in to open cholecystectomy. Objective: To study pre-operative factors in the patients to predict whether the laparoscopic cholecystectomy will be easy or difficult and to co-relate the pre-operative factors predicting a difficult Laparoscopic Cholecystectomy with intra-operative findings. Methods: This prospective study was carried out in the Department of General Surgery over a period of 2 years. Total 100 patients were included in the study. All patients were evaluated for risk factors preoperatively and intraoperative findings were noted. A chi-square test has been used to find the significant association of findings of the preoperative score with postoperative outcome. Results: 11 (11%) were males and 89 (89%) were females. In this series, age range for the enrolled patients was from 15 to 60 years. Majority were in the group 20-40 years of age (80 patients, 80%). It included 23 (23%) with tubectomy, 4 (4%) patients with lower (uterine) segment cesarean section, 2 (2%) with appendectomy and 2 (2%) with hysterectomy. No significant association was found between the age >50 years (p=0.26),

male gender (p-0.59), BMI >25 kg/m² (p-0.85), history of previous supraumbilical surgery (p-0.254) and intraoperative difficulty during laparoscopic cholecystectomy. We found significant relation between History of hospitalisation for gall stone diseases (p-0.04), gall bladder wall thickness >4 mm (p-0.03), pericholecystic collection (p-0.01), impacted stone at the neck of gall bladder (p-0.02). Conclusions: A uniform scoring system needs to be assessed and thoroughly evaluated by combining all these factors to predict a difficult laparoscopic cholecystectomy.

Keywords---Laparoscopic cholecystectomy, Difficult, Predictive factors, Gall stone diseases, Open cholecystectomy.

Introduction

Cholecystectomy was considered as the surgical procedure for the management of symptomatic gall stone disease in 1882 when its pioneer Carl Johann Langenbuch performed the first open cholecystectomy for cholelithiasis.[1] In 1987, Philippe Mouret performed the first laparoscopic cholecystectomy.[2] The advantages of laparoscopic cholecystectomy are as Earlier return to bowel function, Less postoperative pain, Cosmetics, Shorter length of hospital stay, earlier return to full activity, Avoidance of large surgical incision, and Decreased overall cost.[3–5]

Laparoscopic cholecystectomy is the gold standard treatment for cholelithiasis. It has now become one of the most common operations performed by general surgeons. Since the introduction of laparoscopic cholecystectomy, the number of cholecystectomy performed in India has been increased due to widespread use of radiological investigation for screening. The advantages of laparoscopic cholecystectomy are earlier return to bowel function, less postoperative pain, cosmetic, shorter length of hospital stay, earlier return to full activity, and decreased overall cost.[4]

Laparoscopic cholecystectomy (LC) though considered safe and effective, yet can become difficult at times due to various problems faced during a surgical procedure. Various problems encountered include problems in identifying anatomy secondary to adhesions or inflammation, anatomical variation, creating pneumoperitoneum, accessing peritoneal cavity, releasing adhesions, fibrotic and contracted gall bladder, and extracting the gall bladder.[6,7] Preoperative prediction of “difficult laparoscopic cholecystectomy” may help in improving patient safety, proper preoperative planning and counselling, deciding the approach (open/laparoscopic), reducing conversion rate, and reduce overall complications and morbidity. The rationale behind the study was to identify the various factors that can predict difficulty in laparoscopic cholecystectomy.

Materials and Methods

It was a Prospective Observational study Patients having acute or chronic calculous cholecystitis, gall bladder polyps, and symptomatic cholelithiasis

irrespective of age, sex is included in this study. Patients having associated CBD calculi, gallbladder perforations, Acalculous cholecystitis, Pre-operative diagnosed Mirizzi Syndrome, suspected or proven gall bladder malignancy, deranged LFT, and Features of obstructive jaundice, unfit for general anaesthesia have been excluded. Sample size calculated by universal sampling method. Study population included those who fulfil inclusion criteria of the study and those who did not fulfil criteria were excluded from study over a period of 2 years.

The patients were evaluated preoperatively with detail history, examination, blood investigations, and USG abdomen after overnight fasting. Following preoperative factors were considered in this study: Age, Gender, History of hospitalization for gall stone diseases, history of previous supraumbilical surgery, body mass index, and usg findings as -gall bladder wall thickness, pericholecystic collection, and impacted stone at the neck of GB. All study factors were evaluated as dichotomous variables.

Intraoperative findings were noted as:

Easy- time taken for surgery (time taken from insertion of first port to removal of last port) is less than 60 minutes, no bile spillage, no injury to bile duct/ vascular structures.

Difficult- time taken for surgery is 60-120 minutes, bile or stone spillage, vascular/bile duct injury but no conversion.

Very difficult- time taken >120 minutes, conversion to open cholecystectomy. The study was approved by Ethics Committee and written informed consent was taken.

Statistical Analysis

The statistical software namely statistical package for social sciences (SPSS) 22.0 was used for the analysis of the data. Categorical data represented in frequencies and proportions. Chi-square test has been used to find the significant association of findings of preoperative score with post-operative outcome. $P < 0.05$ is considered as statistically significant value.

Results

Table 1-Baseline clinical characteristics of the enrolled patients that underwent laparoscopic cholecystectomy

Factors	Results
Meanage $\pm$ SD(years)	42.16 $\pm$ 11.84
Malegender,n(%)	11 (11)
BMI,n(%)	
<25	26 (26)
25.1-30	60 (60)
>30	14 (14)
Previous surgical history,n(%)	
Tubectomy	23 (23)
LSCS	4 (4)

Appendectomy	2 (2)
Hysterectomy	2 (2)
Ultrasonography findings, n(%)	
Multiple calculi	66 (66)
Solitary calculi	19 (19)
Impacted calculi	15 (15)
Wall thickening	32 (32)
Pericholecystic collection	12 (12)
Palpable gall bladder, n(%)	5 (5)
History of hospitalization, n(%)	9 (9)

As per table 1 study comprises of 100 cases that were studied prospectively over a period of 2 years, of which 11 (11%) were males and 89 (89%) were females. In this series, age range for the enrolled patients was from 15 to 60 years. Majority were in the group 20-40 years of age (80 patients, 80%). It included 23 (23%) with tubectomy, 4 (4%) patients with lower (uterine) segment cesarean section, 2 (2%) with appendectomy and 2 (2%) with hysterectomy. Hence, 31 (31%) patients presented with scar over abdomen. Only two had supra umbilical scar while rest 29 had an infra umbilical scar. Nine (9%) patients of 100 had a previous history of admission; 7 (7%) for acute cholecystitis, 2 (2%) for obstructive jaundice had ERCP with stenting.

Table 2-Pre-Operative factors

Criteria		Easy	Difficult	Very difficult	P
Age(years)	<50	35	28	4	0.26
	>50	13	19	1	
Gender	Male	4	6	1	0.59
	Female	43	40	6	
BMI(kg/ m²)	<25	45	34	3	0.85
	>25	2	15	1	
Abdominal scar	Yes	1	4	1	0.54
	No	21	23	2	
H/O hospitalisation	Yes	12	18	30	0.04*
	No	23	15	2	
GB wall thickness(mm)	<4	55	26	12	0.03*
	>4	1	5	1	
Pericholecystic collection	Yes	1	7	2	0.01*
	No	27	13	2	
Impacted stone	Yes	4	10	1	0.02*

As per table 2 No significant association was found between the age >50 years (p-0.26), male gender (p-0.59), BMI >25 kg/m² (p-0.85), history of previous supraumbilical surgery (p-0.254) and intraoperative difficulty during laparoscopic cholecystectomy. We found significant relation between History of hospitalisation

for gall stone diseases ($p=0.04$), gall bladder wall thickness >4 mm ($p=0.03$), pericholecystic collection ($p=0.01$), impacted stone at the neck of gall bladder ($p=0.02$). Out of 100 patients, 39 patients took <60 min, 49 patients took time 60-120 min. 12 patients were converted to open cholecystectomy.

Discussion

In general age above 50 years makes LC difficult with increasing age due to recurrent attacks of cholecystitis and increased age has more chances of previous history of operative surgery.[4,6] Men with symptomatic gall stone disease are more prone to inflammation and fibrosis with the same disease intensity as compared to females, hence male gender is considered as predictive factor for difficult LC. We found that male gender is insignificant factor for predicting a difficult LC ($p=0.596$) and it is consistent with previous studies but not corresponds with the study done as male to female ratio in their study is very high.[7,8,9].

Previous surgical intervention can cause adhesions. Presence of adhesions especially umbilical and supraumbilical are proven to be predictors of difficult LC, limiting the access to target the gall bladder.[10] Hence presence of supraumbilical scar is considered as predictive factor for difficult LC. We found that, history of upper abdominal surgery/supraumbilical scar is insignificant factor for predicting a difficult LC. ($p=0.254$) and is consistent with previous studies but not with study conducted by Bunkar et al because of in their study, number of patients were less as well as nearly 1/3rd out of 30 had a supraumbilical scar.[10,11]

Presence of inflammatory fluid outside gall bladder are more associated to have dense adhesions and also associated with difficulty identifying Calot's triangle due to inflammation and distortion of anatomy. Hence, presence of pericholecystic collection seen on USG is considered as factors for predicting a difficult LC and absence of pericholecystic collection is considered as factor for predicting an easy LC. In the present study, we found that presence of pericholecystic collection is significant factor for predicting a difficult LC ($p=0.01$).and is consistent with previous studies.[9,10,11]

Impacted stone at the neck of gall bladder makes LC difficult at the time of Calot's dissection and during the times of duct identification and clipping, also presence of large stones in the gall bladder neck leads to distention and difficulty in grasping. In present study, impacted stone at the neck of GB was considered as predictive factor for difficult LC and a mobile stone or a stone elsewhere in GB is considered as factor to predict an easy LC. We found that, impacted stone at the neck of GB is significant factor for predicting a difficult LC ($p=0.02$) and is consistent with previous studies.[11,12]

Conclusion

History of hospitalization for gall stone diseases, an ultrasound abdomen showing gall bladder wall thickness >4 mm, presence of pericholecystic collection, and an impacted stone at the neck of gall bladder can be considered as individual

significant positive factors to predict a difficult laparoscopic cholecystectomy preoperatively. A uniform scoring system needs to be assessed and thoroughly evaluated by combining all these factors to predict a difficult laparoscopic cholecystectomy.

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