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PREOPERATIVE PREDICTORS OF A DIFFICULT LAPAROSCOPIC CHOLECYSTECTOMY

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ABSTRACT:

Background: Laparoscopic cholecystectomy (LC), the gold standard of treatment of gallstone disease, is a widely performed surgery, but it can become a challenge at times. Aim of present study was to find out the possible preoperative features in a gallstone disease patient that predispose him to having a difficult LC.

Methods: All cases of gallstone disease undergoing LC at Government General Hospital,Guntur were studied over one year Various preoperative clinical, laboratory and ultrasound parameters were studied to see their correlation with difficult LC. The cases confirmed by USG were evaluated with the following risk factors: age>50yrs,male sex, BMI 25.1-27 and >27.5,prior surgery, prior hospital admission, palpable gall bladder, gall bladder thickening, impacted stone, pericholystitic collection. Each risk factor is given a score.The total score upto 5 predicted easy surgery, 6-10 difficult and >10 is very difficult surgery.

Results: 85 patients were studied with age ranging from 21-65 years, maximum incidence (53%) being in 35-50 years. The time taken for LC increased significantly with increasing age. 60% were females but gender status did not affect the difficulty. Pain in the past 15 days of surgery increased the operating time as did the association of diabetes mellitus. Increasing body mass index (BMI) also increased the surgery time as well as the conversion rate (more with BMI >30Kg/m2). Clinically palpable gallbladder increased the surgery duration, difficulty and conversion rate. TLC >11000/mm3, contracted gallbladder, wall thickness ≥4mm made LC longer, while multiple stones increased surgeon's difficulty and impacted stone in gallbladder neck increased the conversion rate.

The highest age incidence of cholelithiasis was in the 4th decade, and was more common in females. Pain abdomen was the most common symptom. BMI >27.5 (P<0.001), history of prior hospitalization (P<0.0008), palpable gallbladder (p<0.0364), impacted stone (P<0.0103) and pericholecystic collection (P<0.0471) were significant predictors of difficult laparoscopic cholecystectomy.

INTERPRETATION AND CONCLUSION

The proposed scoring system had a positive prediction value for easy prediction of 94.7% and for difficult prediction of 100%.The conversion rate from laparoscopic cholecystectomy to open cholecystectomy was 3%.Certain factors that increase the difficulty of LC can be identified preoperatively and this knowledge should be used when planning LC.

Introduction

Gallstones are the most common biliary pathology. It is estimated that gallstones affect 10–15% of the population1 . Approximately 1–2% of asymptomatic patients will develop symptoms requiring surgery per year, making cholecystectomy one of the most common operations performed by general surgeons. More than 80% of gallstone carriers are asymptomatic and it has been estimated that about 1%-2% of these develop complications and need surgery every year. Complications of gallstone disease include acute and chronic cholecystitis, gallbladder perforation, choledocholithiasis with or without cholangitis, Mirizzi syndrome, cholecysto-enteric fistula, gallstone ileus and gallstone pancreatitis[2].

The National Institute of Health (NIH) consensus development conference stated that laparoscopic cholecystectomy "provides a safe and effective treatment for most patients with symptomatic gallstones3. The advantages of laparoscopic cholecystectomy over open cholecystectomy are earlier return to bowel functions, less postoperative pain, informed cosmesis, shorter length of hospital stay, earlier return to full activity, and decreased overall cost..Laparoscopic cholecystectomy is associated with better preservation of immune function and a reduction of the inflammatory response compared with open surgery. The rate of postoperative infections seems to be lower.[4]

Laparoscopic cholecystectomy (LC), though performed extensively, requires favourable patient characteristics, suitable equipment support and adequate surgical expertise for successful completion. In certain patients the laparoscopic approach may become time-taking, technically challenging and may even be abandoned, sometimes in an emergency, for the open approach. Rate of conversion from LC to OC varies from 1% to 15% . Difficult cholecystectomies increase perioperative time , complication rates, length of hospital stay and costs. Complications include bile duct injury, bile leak, significant bleeding, iatrogenic injuries to adjacent viscera and even death. It is, therefore important to identify factors that predispose a patient to have difficult LC. This will aid to identify the subset of gallstone disease patients who require special planning. Many tried to identify such cases either preoperatively based on some clinical, laboratory or ultrasound parameters; or early in the course of laparoscopic approach based on the per-operative findings.

Aims and objectives

To find out the possible preoperative (clinical, laboratory and ultrasound) factors in patients with gallstone disease that predispose them to have difficult LC based on the time taken, difficulty assessment by operating surgeon and conversion to OC.

Patients and Methods

All cases of symptomatic gallstones undergoing elective LC at Government General Hospital,Guntur were studied over one year(January 2018 to January 2019) in a prospective manner.

Inclusion criteria

The patients aged between 20 and 65 yrs presenting with

symptoms and signs of Cholelithiasis/ Cholecystitis and diagnosed by USG examination in surgical ward of Government General Hospital,Guntur

Exclusion criteria

Patients with jaundice, abnormal liver function tests, concomitant common bile duct stones, ongoing acute cholecystitis or concurrent gallstone pancreatitis are excluded.

Patients <20yrs and >65 yrs , not willling for surgery are excluded Preoperavtive assessment The selected patients were counselled about the procedure and consent was taken regarding participation in the study as well as for surgery. 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 taken including age , gender, whether the patient had experienced biliary pain 15 days prior to surgery, past history of jaundice, acute cholecystitis, gallstone pancreatitis and associated diabetes mellitus. 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. Preoperative lab investigations were carried out as part of pre-anaesthesia check-up and total leucocyte count (TLC) was considered for the study. 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 and evidence of fatty or cirrhotic liver. It was repeated on the morning of the surgery, after overnight fasting to assess the immediate preoperative status, including the distensibility of gallbladder.

LC was done under general anaesthesia as per standard American technique, using a 10mm 30 degree telescope, three-chip video camera and high-resolution monitor. Pneumoperitoneum created with carbon dioxide by using Hassans technique. Two trained laparoscopic surgeons, who had performed at least 20 LC earlier, were involved in the study. The surgeons opined on the per-operative degree of difficulty depending on an objective questionnaire which included presence and degree of peri-gallbladder adhesions and adhesions in the Calot's triangle, gallbladder wall thickness, estimated peroperative blood loss, requirement of abdominal drain, duration of the procedure, iatrogenic injury to neighbouring structures and if conversion to OC was required. The time taken for surgery from initial incision for insertion of laparoscopic ports to final skin closure was noted. RISK FACTORS OF DIFFICULT LAPAROSCOPIC CHOLECYSTECTOMY

CLINICAL RISK FACTORS

a) Stocky male patients due to difficulty in initial port placement
b) Multiparous women with flabby abdomen
c) Previous upper abdominal surgery
d) Cirrhosis
e) Present or previous acute cholecystitis or acute severe pancreatitis
f) Previous treatment: percutaneous drainage or cholecystostomy

ULTRASOUND CRITERIAS

a. Thick walled gallbladder(>4 mm)
b. Contracted (nonfunctioning) gallbladder
c. Packed stones and large calcified GB.
d. Polyp or mass lesion without acoustic shadow
e. Evidence of acute cholecystitis
f. impacted stonesEdematous gallbladder wall
g. Pericholecystic fluid collection
h. Air in the gallbladder (emphysematous cholecystitis)
I. Subphrenic collection
j. Intraperitoneal fluid collection due to perforated GB
k. Fatty liver

The various preoperative independent variables were correlated with the following dependent variables; time taken per-operatively, degree of difficulty encountered as per surgeon, and conversion to open surgery; and it was statistically analysed by Pearson correlation coefficient and Chi square test, p value was considered significant if <0.05.

RESULTS

The study included a total of 85 patients with age ranging from 20 years to 65 years. The maximum incidence 53(62%) was seen in the age group of 35 to 50 years. There was a higher proportion of females 52(61%). Two (2.3%) patients had experienced pain abdomen in last 15 days prior to the day of surgery. Diabetes mellitus was present in 15 (17.6%) patients. Two(2.3%) patients gave history of gallstone pancreatitis in the past while 20(23.5%) patients had history suggestive of acute cholecystitis in the past. In the study population, BMI ranged from 20kg/m2 to 35kg/m2. The maximum number of patients, 42(49.4%) had a BMI of 25-30kg/m2. Gallbladder was palpable in one(1.2%) patient and tenderness in right hypochondrium was demonstrated in two (2.3%)patients. Three (4%) patients had TLC >11000/mm3. 60 (70%) patients had multiple stones in gall bladder on preoperative ultrasound while three (3.5%) were found to have impacted stones in gallbladder neck or Hartmann's pouch. Ultrasound also revealed contracted gallbladder in 8 (9.4%) patients and gallbladder wall thickness ≥4mm in 4(4.7%) patients. 2 (2.3%) had sonographic evidence of fatty liver, but no cirrhotic livers were encountered.

LC to OC was done in 3(3.6%) patients. Among the dependent variables, duration of surgery was >75 minutes in 9 (10%) patients, while overall mean duration of surgery was 56.48 minutes. In 16 (18%) patients, the surgery was described as difficult by the operating surgeon based on the objective parameters. In three patients, the laparoscopic surgery was not progressing satisfactorily and was converted to open approach, giving a conversion rate of 3.6%.

The correlation of pre-op score and the outcome

PRE-OP SCORE	easy	DIFFICULT	VERY DIFFICULT	TOTAL
0-5	60	4	3	67
6-10	0	12	4	16
11-15	0	0	2	2
TOTAL	60	16	9	85

The correlation of these independent preoperative variables with duration of surgery, per-operative difficulty, and conversion to open surgery is summarised

RISK FACTORS	LEVEL	PER-OP OUTCOME		P VALUE	
		D-NO (%)	E-NO (%)	PS	R5
Age	</= 50 Y	14	50	1.000	0.937
	>50 Y	2	12		
Sex	FEMALE	12	40	0.6976	0.736
	MALE	4	20		
BMI wt(kg)/ht(m2)	<=25	2	45	0.4324	0.227
	25.1-27.5	2	13		
	>27.5	12	2	<0.0001	0.010
Previous surg.	Nil	12	40	0.6959	0.882
	yes	4	20		
Hospitalization	Nil	10	60	0.0008	<0.001
	Yes	6	0		
GB palpable	NP	12	60	0.0364	0.022
	Yes	4	0		
Usg- wall thick	N	2	50	0.0001	0.038
	Yes	14	10		
Impacted stone	Nil	10	56	0.0103	0.190

	Yes	6	4		
P/c collection	Nil	10	56	0.0471	0.999
	Yes	6	4		

D-Difficult E-Easy PS-Present study R-Journal with reference to no5 bibliography NP-Non palpable N-Normal P value-Predictive value.

Only 2 patients had infection of the epigastric port site which required about 2 to 3 dressing.82 cases were reported as chronic cholecystitis, while three were reported as acute cholecystitis. No case of malignancy of the GB was detected.

DISCUSSION

LC has lower incidence of postoperative pain, morbidity and shorter hospital stay. Also an integral part of surgery residency program worldwide, with residents doing more LC than OC. Hence done by surgeons of varying expertise, and a difficult LC can become disastrous in hands of a surgeon who is at the start of his learning curve. This usually caused by certain patient factors and if these can be identified preoperatively, it can benefit the patient by reducing the complications.

Age is one such factor. In present study , as age of patient increased, the time taken for surgery increased significantly in a linear fashion with maximum mean time of 64.44 minutes in the age group of 55 years and above. No significant correlation with surgeon's difficulty or conversion to OC as was also reported by Jethwani et al study8. Hu et al found that older age, more than 65 years, was an important risk factor and they had 3-5 fold chance of conversion to OC.7 Philip Rothman et al concluded that quality of evidence for age as a risk factor for conversion was low9 .Older age is associated with difficult Calot's triangle dissection due to recurrent attacks of inflammation in the past as well as due to co-morbidities11.

Male gender has been considered to be associated with difficult LC, but no significant difference between genders in present study. In the total of three conversions one was in females and 2 in males. Hu et al found male gender to be a significant risk factor .Studies by Lipman et al and Sanabria et al showing a four-fold higher risk in male. Kanakala et al found male sex to be the only significant factor to predict operative mortality in Lc10.

An episode of biliary pain within 15 days prior to surgery was associated with significant longer operating time in present study but no affect on per-operative difficulty or the rate of conversion. The pain could be associated with inflammation of gallbladder and may have caused adhesion formation or thickening of the gallbladder wall leading to lengthening of the surgery time Diabetes mellitus was associated with longer duration of surgery but no significant correlation with surgeon's difficulty or conversion rate. Stanisic et al reported significantly higher difficulty during LC in diabetics while Raman et al and Ibrahim et al too found diabetes mellitus to be an important risk factor[12] .

Significant correlation of rising BMI with increasing duration of surgery with the highest mean of 64.38 min in those with BMI >30kg/m2 and lowest mean of 52.50 min in those with BMI <20kg/m2. The rate of conversion is high in patients having BMI >30kg/m2. Hu et al concluded that high BMI is an important risk factor for conversion7. Philip Rothman et al found the quality of evidence for weight as a risk factor to be very low9 .Vivek et al found that BMI >30kg/m2 was associated with difficult umbilical port entry11. Stanisic et al found that BMI >30kg/m2 significantly affected creation of pneumoperitoneum and placement of working ports[12].

One patient has clinically palpable gallbladder in the present study, all the dependent variables of LC were significantly altered. The mean duration of surgery was significantly higher (102.5 minutes vs 55.91 minutes, p <0.05). So was the per-operative difficulty and conversion to open. However, no studies were found in literature that evaluated a clinically palpable gallbladder, instead there were studies which assessed either ultrasound or preoperative finding of distended gallbladder. Van der Velden et al found that a distended gall bladder ≥4.5cm was the only single ultrasound predictor of conversion13. Vivek et al reported that distended gallbladder significantly increased the difficulty in grasping of gallbladder, adhesiolysis, Calot's dissection and extraction of gallbladder[11].

A positive correlation between TLC >11000/mm3 and duration of surgery, but no effect on the surgeon's difficulty or the conversion rate. Hu et al reported significant association of TLC with conversion7. However, meta-analysis by Philip Rothman et al found the association to be of low quality.

Among the stone characteristics, the author found multiple stones to increase surgeon's difficulty while impacted stone in gallbladder neck was associated with higher conversion rate. Vivek et al found multiple stones to be strongly associated with difficulty in adhesiolysis, Calot's dissection and gall bladder extraction11. Stanisic et al found impacted stone in cystic duct or Hartmann pouch to significantly increase the difficulty in Calot's dissection12. Hu et al showed association of impacted stone at gallbladder neck with conversion [7].

The present study showed that contracted gallbladder and gallbladder wall thickness ≥4mm were strongly related to increased duration of surgery independently, but did not affect surgeon's difficulty or conversion rate. Hu et al7 Stanisic et al12 and Vivek et al11 found gallbladder wall thickness >4mm to be significantly associated with difficult Calot's triangle and gallbladder dissection Philip Rothman et al, found moderate quality of evidence to suggest that gallbladder wall thickness more than 4-5mm was a risk factor for conversion to OC9 . They also found a similar correlation with contracted gall bladder on ultrasound9.

Three cases of interval LC for acute cholecystitis where the operation time was 70 minutes compared to the mean time of 56.39 minutes observed in the remaining cases and no conversion was required. No interference was drawn as only few cases, and this has been a limitation of the present study.

Stanisic et al reported that previous attack of acute cholecystitis significantly increased difficulty in dissection of gall bladder12. Similar findings were also noted by Nachnani et al14. Present study did not find any correlation of history of gallstone pancreatitis, tenderness in right hypochondrium or fatty liver with the dependent variables of LC. Both Hu et al and Philip Rothman et al, did not report any significance of these variables7,9.However, Nachnani et al had reported difficulty in delineating anatomy after previous attack of acute pancreatitis[14].

Considering experienced surgeons operating on the study population, one of the dependent variables, i.e. conversion rate, was quite low (3.8%), whereas literature has reported up to 27.7%, the lowest being 1.8%. Though the experience of the surgeons added strength to the present study, the low conversion figure would have skewed the data that has been generated and also its applicability, especially in a teaching hospital.

CONCLUSION

In conclusion, certain preoperative parameters like increasing age, rising BMI, pain abdomen in the preceding 15 days, concomitant diabetes mellitus, clinically palpable gallbladder, TLC >11000/mm3, multiple gallstones, impacted stone in neck of gallbladder, contracted gallbladder and wall thickness ≥4mm are significant risk factors for difficult cholecystectomy and possible conversion to open surgery.

The positive predictive value for easy prediction was 94.7% and for difficult prediction was 100%.Patients with these factors should be properly counselled regarding the higher chance of conversion and possible longer hospitalisation so that they can schedule their LC accordingly. These patients should be listed keeping in mind that

surgery might be prolonged; and they should be operated upon by an experienced surgeon or under his supervision to minimise complications.

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