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A study on operative difficulties faced during laparoscopic cholecystectomy, using clinical findings and ultrasound criteria

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Abstract---Background and Objectives: Cholelithiasis is one of the most common biliary pathologies, affecting about 10-15% of the general population. At present, most of the surgeries are done by laparoscopic procedures, and have replaced open cholecystectomy. Sometimes, laparoscopic cholecystectomy is easy and can be done quickly. In few cases, it will be difficult and various problems can arise during surgery, requiring open cholecystectomy. There is a need to evaluate the clinical factors, lab investigations and ultrasound findings, in predicting the conversion of laparoscopic to open procedure, as open procedure carries more morbidity in view of post-operative pain, prolonged hospital stay, difficulty in breathing, and patients can be made aware of the risks of conversion to open cholecystectomy. Objectives: The objective of study is to predict which clinical findings, lab investigations and preoperative ultrasound findings best correlates with most common operative difficulties faced during laparoscopic cholecystectomy. Materials and Methods: After institutional ethical committee approval and with written informed consent, 50 patients of either sex between 18-80 years of age, who would be planned for elective Laparoscopic Cholecystectomy at Yenepoya Medical College Hospital under Department of General Surgery over a period from August 2020 to August 2021 will be randomly selected for this prospective observational study. Results: The age of maximum incidence of cholelithiasis is 31-40 years of age and was more common in female sex. Right upper abdominal pain is the most common symptom. Ultrasound detected gall bladder stones in 49 patients, 11 patients have gall bladder wall thickening in

patients, 5 patients have pericholecystic fluid, 26 patients had stone at neck/ multiple calculi, no patient showed structural abnormality or liver cirrhosis. The preoperative score predicted easy cholecystectomy in 49 patients, out of which 39 patients had easy cholecystectomy and 10 patients had difficult cholecystectomy. Only one patient was predicted with difficult cholecystectomy and had difficult procedure. The conversion rate from laparoscopic cholecystectomy to open cholecystectomy was 2%. Interpretation and Conclusion: The proposed system of identification of easy laparoscopic cholecystectomy has a positive predictive value of 79.59% and for difficult laparoscopic cholecystectomy of 100%. The conversion rate from laparoscopic to open cholecystectomy was 2 %. Preoperative clinical findings, laboratory investigations and ultrasound help in detecting the complications of cholelithiasis and helps the surgeon to prepare for the surgery, laparoscopic cholecystectomy prior to surgery, for better patient care, and reduce peri and post-operative complications.

Keywords---Operative Difficulties, Laparoscopic Cholecystectomy, Ultrasound Criteria.

Introduction

Gall stones is one of the most common pathologies of the biliary tree, seen in 10-15% of the adult population in western societies. They are asymptomatic in more than 80% of the cases. The prevalence of cholelithiasis at time of death is 17% and is increasing. Incidence of gall stones in India is 4%, increasing due to western culture, high detection rates, changing socio-economic class, and is 7 times more commonly seen in North Indians than South Indians. The incidence of Laparoscopic cholecystectomy increases after 21 years of age and reaches peak by 50-60 years of age. Laparoscopic cholecystectomy is one of the most performed operative procedures by general surgeons, with 1-2% of patients requiring laparoscopic cholecystectomy. It is considered as gold standard for patients with benign gall bladder disease, both in elective and emergency conditions. ^(1,2) Laparoscopic cholecystectomy, the keyhole surgery, is advantageous over open cholecystectomy, due to minimally invasive, earlier return of bowel function, less post op pain, better cosmesis, shorter hospital stay, early recovery, lower cost, better preservation of immune function. . The factors leading to conversion include difficult anatomy, uncontrollable bleeding, CBD injury or equipment failure, technical difficulties, steep learning curve. ⁽³⁾ In a country like India, where loss of working days and medical costs, constitute major issues, laparoscopic cholecystectomy is better than open cholecystectomy. Despite, increasing availability and acceptability of laparoscopic cholecystectomy, the complications should be kept in mind and carries risk of conversion to open (risk of 15-19%) ⁽⁴⁾. The incidence of bile duct injuries (0.2-0.8%) is significantly higher than in open procedure (0.1-0.25%). Previous abdominal surgeries make surgery difficult in trocar placement, exposure, increases chance of injury to liver, common bile duct, requiring conversion to open procedure, which is not to be considered as failure. So, the prediction of a difficult laparoscopic cholecystectomy and patient's risk of conversion to open based on preoperative details, will help the surgeon to have

better patient counselling and prepare patient psychologically, better planning for the surgery, improving patient safety and minimizing risks and reducing risk of conversion to open procedure. Hence, this study was undertaken.

Aims

To predict which clinical findings, lab investigations and preoperative ultrasound findings best correlates with most common operative difficulties faced during Laparoscopic cholecystectomy

Objectives

To predict which clinical findings, lab investigations and preoperative ultrasound findings best correlates with most common operative difficulties faced during laparoscopic cholecystectomy.

Materials and Methods

Ethical Clearance: Before starting the study, Yenepoya Ethical Committee Clearance was taken

Source of Collecting Data:

Patients in Yenepoya Medical College Hospital, Mangalore who are admitted for Laparoscopic cholecystectomy during the period from December 2019 to April 2021. The patients will be selected by simple random sampling.

After institutional ethical committee approval and with informed consent 50 patients of either sex between 18-80 years of age, planned for Laparoscopic Cholecystectomy will be selected. The present clinical study is being undertaken to predict the efficacy of clinical examinatory findings, laboratory blood investigations and pre- operative ultrasound of abdomen findings in detecting difficult Laparoscopic Cholecystectomy. This study conducted in 50 patients of either sex, between 18-80 years age, undergoing elective Laparoscopic Cholecystectomy at Yenepoya Medical College & Hospital under Department of General Surgery during December 2019 to April 2021

Materials and Methods

After institutional ethical committee approval and with written informed consent, 50 patients of either sex between 18-80 years of age, who would be planned for elective Laparoscopic Cholecystectomy at Yenepoya Medical College Hospital under Department of General Surgery over a period from 25 July 2020 to 25 June 2021 will be randomly selected for this prospective observational study. All the patients would undergo through preoperative evaluation, which will include detailed history of the patient with focus on age of the patient (whether >/<35 years), sex of the patient (male/female), body mass index of the patient, fever, vomiting, dyspepsia examinatory findings, presence/absence of Murphy sign in the patient.

All routine investigations would be sent, before the surgery, including complete blood count, liver function test, chest x ray, c reactive protein. Then, the patient would undergo a preoperative ultrasonography of the abdomen, and the parameters that would be studied include, visualization of gall bladder, thickness of wall of gall bladder ($\leq$ 4 mm), presence / absence of gall bladder stone at neck of gall bladder/Hartmann pouch, presence/ absence of pericholecystic fluid, presence of any structural abnormalities/distortions of gall bladder/biliary tree, presence/ absence of liver cirrhosis.

The participant would then be explained about his clinical condition and the surgery that he would undergo- Laparoscopic Cholecystectomy under general anesthesia. The participant would be explained in a language understandable to him about the risks would be associated with the surgery like, bleeding, infection, bile leakage, injury to bile duct, bowel, and neighboring blood vessels, Deep vein thrombosis, Risks of General anesthesia and will be proceeded after the patient gives consent for the same. Compensation for the Severe Adverse Events associated with the surgery and associated with General Anaesthesia will be decided by the Yenepoya Ethics Committee 2. Treatment needed for the severe adverse effects will be taken care by the PI.

After that, the patient will be deemed for surgery after pre-anesthetic evaluation. After starting of the procedure of laparoscopic cholecystectomy, the procedure would be recorded. The intraoperative findings that would be considered include total duration of surgery, presence/absence of stone spillage, tear of gall bladder, stone at neck of gall bladder, adhesions in the abdomen, ability to grasp gall bladder using atraumatic laparoscopic forceps, tear in cystic artery, abnormal anatomy of gall bladder and bile ductal system, and if the laparoscopic cholecystectomy procedure had to be converted to open procedure.

Inclusion Criteria

- All patients of age 18-80 years, of both sexes.
- Patients with cholelithiasis, admitted at Yenepoya Medical College Hospital, Deralkatte planned for laparoscopic cholecystectomy

Exclusion Criteria:

Patients with

- Common Bile Duct stones
- Patients with history of current Pregnancy
- Features of Peritonitis.
- Empyema of gall bladder, carcinoma of gall bladder.
- Portal hypertension.
- Previous history of upper abdominal surgery.
- Laparoscopic cholecystectomy combined with other surgical procedure
- Patients who refuse to participate in the study will be excluded.

Statistical Analysis

The data collected was tabulated in Microsoft excel to generate tables and figures. Test of significance- Fischer's exact test. Significance was assessed at 5 % level of significance ($p < 0.05$).

Results

The study consists of 50 patients with cholelithiasis who underwent Laparoscopic Cholecystectomy in various surgical wards during the period between 25 July 2020 to 25 June 2021 at Yenepoya Medical College Hospital, Mangalore.

Table 1: Age Distribution:

Age in Years	Number of Cases	Percentage
18-30 years	5	10%
31-40 years	19	38%
41-50 years	15	30%
Above 50 years	11	22%

Table 2: Sex Distribution:

Sex	Number of Cases	Percentage
Male	13	26
Female	37	74

Table 3: presenting symptoms

Clinical Features	Number of patients	Percentage (%)
Abdominal Pain	50	100
Vomiting	18	36
Fever	5	10
Dyspepsia	15	30
Jaundice	3	6

Table 4: Comorbidities

Comorbidity	Number	Percentage (%)
Diabetes mellitus	4	8
Hypertension	10	20
Hypothyroidism	2	4
Acute pancreatitis	3	6
COPD	1	2
Retroviral Disease	1	2

Note: Out of 50 patients, only 7 patients had previous abdominal surgeries.

Table 5: Presenting Signs

Palpation	Number	Percentage (%)
Abdominal Tenderness (Right Hypochondrium /Epigastric)	44	88
Palpable Gall Bladder	2	4
Murphy Sign	6	12

Table 6: Laboratory Parameters

Laboratory Parameter		Number	Percentage (%)
Total Leucocyte count	Abnormal (>11000/ml) Score- 1	10	20
	Normal (4000-11000/ml) Score -0	40	80
Liver Function test	Abnormal (1)	3	6
	Normal (0)	47	94

Table 7: Ultrasonography

Ultrasound Findings		Number of Patients	Percentage (%)
Visualisation of Gall Bladder	Present	50	100
	Absent	0	0
Gall Bladder wall Thickening (>4mm)	Present	11	22
	Absent	39	78
SOLITARY STONE IMPACTED AT NECK OF GALL BLADDER/HARTMANN POUCH OR GALL BLADDER PACKED WITH STONES	Present	26	52
	Absent	24	48
Pericholecystic Fluid Collection	Present	5	10
	Absent	45	90
Structural Abnormalities	Present	0	0
	Absent	50	100
Liver Cirrhosis	Present	0	0
	Absent	50	100

Table 8: Analysis of Pre- Operative Predicting score

Pre- Operative Score	Number of Patients	Percentage
1-7 (Easy)	49	94
8-14 (Difficult)	1	6

Table 9: Analysis of Intraoperative Difficulties faced by surgeons during laparoscopic Cholecystectomy

Intraoperative Findings		Number of Patients	Percentage
Duration of Surgery	Less than 90 min (0)	18	36
	Greater than 90 min (1)	32	64
Spillage of Gall stones	Present (1)	20	40
	Absent (0)	30	60
Tear of Gall Bladder	Present (1)	13	26
	Absent (0)	37	74
Stone at neck of gall bladder	Present (1)	13	26
	Absent (0)	37	74
Adhesions	Nil (0)	23	46
	Less than 50% (1)	21	42
	Buried Gall Bladder (3)	6	12
Ability to grasp gall bladder with atraumatic laparoscopic forceps	Cannot grasp (1)	17	34
	Can grasp (0)	33	66
Tear of Cystic Artery	Present (1)	3	6
	Absent (0)	47	94
Abnormal Anatomy of gall bladder and duct system	Present (1)	8	16
	Absent (0)	44	88
Conversion to Open Procedure	Present (1)	1	2
	Absent (0)	49	98

Table 10: Corelation of Pre-operative score and Intraoperative Outcome of Surgery

Preop Prediction		Intraoperative Difficulty	
	N	Easy	Difficult
Easy	49	39	10
Difficult	1	0	1

Discussion

Majority of the patients in the present study were in the age group of 31-40 years of age. In many studies conducted on laparoscopic cholecystectomy, it was found that female gender is associated with more incidence of cholelithiasis. In our study, out of 50 patients, 74 % patients were females, and 26% patients were male. All the 50 patients presented with pain in upper abdomen, ranging from durations of 3 days till 2 years of age. Vomiting was present in 36% of the

patients. Fever was present in 10% of the patients and was mild to moderate, associated with chills in few patients. Dyspepsia was present in 30% of the patients and were treated with proton pump inhibitors. Jaundice was noted in 6% patients, which was secondary to Mirizzi Syndrome or secondary to cholangitis. Out of the all the patients who participated in the study, 14% patients had previous surgeries. patients had acute pancreatitis and were treated conservatively. 8% of the patients have diabetes mellitus, 20% of them were hypertensive, 2% had COPD, 4% had hypothyroidism, on thyroid supplementation and 1 patient has retroviral disease. In our study, 14% of the patients had history of previous abdominal surgery. It was thought that previous abdominal surgery causes adhesions between viscera and omentum, also carries risk of port site trocar injury and increased risk of conversion from laparoscopic to open procedure, but in our study, correlation could not be made due to low samples. Tenderness in Right hypochondrium and epigastrium was noted in 88 (%) of the patients. Murphy sign was seen in 12% of the patients Gall Bladder was palpable in 4 % of the patients while in the study conducted by Pari A Patule et al, it was palpable in 10.42% of the patients. ⁽⁵⁾

In the study, it was noted that 20% of the patients participated the study showed raised total leucocyte count (>11000/ml) and 6% of the patients had deranged liver function test. In the study conducted by Ravindra Nadoni, raised total leucocyte counts in patients planned for laparoscopic cholecystectomy is seen in 20% of the cases. ⁽⁶⁾

Ultrasound abdomen and pelvis was done in all the patients, as a routine investigation, to diagnose gall stones. All 100% of the patients had visualization of gall bladder. In our study, 22% of the patients have thickening of gall bladder (>4mm). In the study conducted by Ravindra Nadoni et al⁶, 15.5% of the patients showed thickening of gall bladder. In our study, 52% of the patients showed stone impacted in Hartmann pouch/ packed with gall stones, while in a study conducted by Ravindra Naloni, showed 14% of cases showing stone impacted at neck of gall bladder.

Rate of conversion from laparoscopic to open cholecystectomy is reported in books from 7-35% , whereas in our study, it is 2%. In the study done by Cuschieri et al, ⁽⁷⁾ they reported the cause of conversion to open procedure as cystic artery bleeding. In our study, spillage of gall stones were seen in 40% of the cases, which could be attributed to improper handling of gall bladder during extraction, not using extraction bag. Only one case in our study with bile spillage had to be converted to open, whereas rest were managed with irrigation and suction of bile and removing spilled gall stones manually. Duration of surgery was longer than 90 minutes in 64% of the cases. ^(8,9)

The most significant preoperative parameter in predicting laparoscopic cholecystectomy is stone impacted at neck of gall bladder or packed with stones, while in study done by Premchand et al showed contracted gall bladder as significant factor for difficult laparoscopic cholecystectomy. But in contrast, study conducted by Carmody showed no correlation between ultrasound findings and difficult laparoscopic cholecystectomy. ⁽²⁾ The preoperative scoring system used in our study showed sensitivity of predicting easy or difficult cholecystectomy of

79.59% with accuracy of 66.67% and positive predictive value of 79.59%. The sensitivity of scoring in our study is better than this study.

Conclusion

Cholelithiasis is increasing rapidly, and now laparoscopic cholecystectomy is commonly done procedure for symptomatic cases. With advancement in medical treatment, now surgeons are considering complex and high risk cases, which were previously avoided, increasing the risk of intraoperative complications and increasing risk of conversion to open procedure, hence we tried to develop a preoperative scoring system to predict operative difficulty to prepare the patient for the unexpected. As per the study, cholelithiasis is more seen in 31-40 years of age, female gender. Abdominal pain is the commonest symptom followed by vomiting, dyspepsia, fever and jaundice. Not all the patients with cholelithiasis present with abdominal tenderness and very few patients show palpable gall bladder. Ultrasonography analysis shows gall bladder is visualized in all the cases, with most patients showing stone impacted at neck of gall bladder/pouch filled with gall stones followed by thickening of the gall bladder. None of the patients in study showed structural abnormalities in gallbladder and biliary system, liver cirrhosis in ultrasound. The risk factors considered in this scoring system include age, fever, comorbid conditions, murphy sign, palpable gall bladder, total leucocyte count, liver function test, ultrasound findings. Out of the study, stone impacted at neck of gall bladder followed by gall bladder wall thickness were better predictors of difficult laparoscopic cholecystectomy. By this study we conclude that difficulties faced during laparoscopic cholecystectomy could be predicted by clinical findings, laboratory parameters and ultrasound findings.

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