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Forecast of difficult Laparoscopic cholecystectomy using Clinical and Sonography parameters: An added advantage

General Surgery

KEYWORDS: Difficult, Laparoscopic cholecystectomy, Ultrasonographic parameters, Open cholecystectomy.

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ABSTRACT

Background: Cholecystectomy is the procedure of choice for symptomatic gall stones. Laparoscopic Cholecystectomy (LC) may be rendered difficult by various problems encountered during surgery. Several factors have been implicated with a difficult case, but no reliable criteria are available yet to identify patients preoperatively with a difficult LC. Preoperative prediction of a difficult LC can help the patient as well as the surgeon prepare better for the intraoperative risk and the risk of conversion to open cholecystectomy. The present study was undertaken to evaluate role of various factors responsible for conversion from laparoscopic to open cholecystectomy and also to study the intraoperative problems faced by the surgeon responsible for conversion in order to make the procedure safer for the patient as well as the surgeon.

Methods: In 100 consecutive patients who underwent LC during 2014 to 2016 patient's characteristics, clinical history, laboratory data, ultrasonography results and intraoperative details were prospectively analyzed to determine predictors of difficult LC.

Results: Of 100 patients 4 (04%) required conversion to open cholecystectomy. Significant predictors of conversion were obscured anatomy of Calot's due to adhesions, male gender and gall bladder wall thickness >3 mm.

Conclusions: With preoperative clinical and ultrasonographic parameters, proper patient selection can be made to help predict difficult LC and a likelihood of conversion to open cholecystectomy.

INTRODUCTION

The advent of laparoscopic era led to revolution in minimally invasive surgery for intra-abdominal pathology. No organ system has seen more progress in the treatment of disease than biliary tract. The first laparoscopic Cholecystectomy was performed by Muhe in 1985.[1] Laparoscopic Cholecystectomy (LC) may be rendered difficult by various problems encountered during surgery such as difficulties in accessing the peritoneal cavity & creating a pneumoperitoneum, bleeding, dissection of gallbladder wall, stone & bile spillage and difficulty in extraction which may require conversion to open cholecystectomy.[2] These may be due to acute inflammation, aberrant anatomy, adhesions, unexpected operative abnormal findings, iatrogenic injuries, obesity and equipment failure.

We analyzed clinical and ultrasonographic parameters that may allow preoperative prediction of difficult LC which could help both the patient as well as the surgeon in order to remain better prepared for the intraoperative catastrophes as well as the conversions to Open Cholecystectomy (OC). Prediction of a difficult LC would allow the patient to prepare psychologically as well as planning their recovery and explaining their absence from work. Another benefit would be to allow more efficient scheduling of the operative list and ensuring the availability of a more experienced laparoscopic surgeon for the procedure.[3-5]

METHODS

This prospective study was carried out on 100 patients who were admitted with cholelithiasis in Surgery department at Subharti medical college, Merrut to undergo LC. All eligible patients within a period from 2014 to 2016 were included in the study. The patients having concomitant common bile duct stones, suspected malignancy, patients below 10 years, those having features of acute pancreatitis, similarly patients having comorbidities and patients not fit for general anaesthesia were excluded. Patients were admitted to the hospital one day prior to surgery and after a detailed clinical history and examination necessary investigations were performed. An informed consent was obtained.

Every patient was subjected to the following assessments which were regarded as risk factors for laparoscopic cholecystectomy[5]

Preoperative (independent) variables included the following
Patients' characteristics

1) Gender.
2) Age was evaluated as both a continuous variable and a dichotomous variable (<65 years versus >65 years).
3) Weight, height and body mass index were used as continuous variables.
4) Body mass index (BMI)

Patients that had BMI of 30 or more were considered obese according to the international definition.6

BMI was also used to describe body habitus as a dichotomous variable (obese >30 versus non obese <30).

Complaints, history and clinical examination

1) Symptoms of pain, dyspepsia and vomiting.
2) History of jaundice.
3) Acute cholecystitis was defined as right upper quadrant pain of acute onset, lasting more than 3 hours, in the presence of fever or leukocytosis, associated with cholelithiasis, thick gall bladder wall more than 4mm, evidence of peri-cholecystic fluid collection, and requiring emergency admission.
4) Previous abdominal surgery was categorized as no surgery versus any intra-abdominal surgery.
5) The clinical signs of cholecystitis: tender right hypochondrium, positive Murphy's sign and palpable gall bladder.

Laboratory data included: complete blood picture, bleeding and coagulation times, fasting blood sugar, serum urea and creatinine, liver transaminases, prothrombin time , serum bilirubin and alkaline phosphatase.

Abdominal ultrasound included following parameters2

1) Shape of gall bladder: Gall bladder was defined as contracted or distended depending on the shape and transverse diameter. It was defined as distended if the transverse diameter was greater than 5 cm.
2) Gall bladder wall thickness was estimated by using the maximal obtainable measurement and evaluated as a dichotomous

variable (thick ≥3 mm versus normal <3 mm).
3) The calculus size was evaluated as a dichotomous variable for the purpose of analysis (small <1 cm versus large ≥1 cm).
4) The number of calculi was classified as a dichotomous variable (solitary versus multiple).

The dependent variables (outcomes) included the following operative parameters

All cases underwent LC with assessment of the difficulties encountered in terms of:

1) Duration of surgery (in minutes): Duration of surgery included the time from insertion of Veress needle to closure of the trocar insertion site and was evaluated as a dichotomous variable (<45 min versus >45 min).
2) Bleeding during surgery: Bleeding during surgery was graded as minimal, moderate or severe. Moderate bleeding was defined as bleeding leading to tachycardia of greater than 100/minute without drop in blood pressure. Severe bleeding was defined as bleeding leading to tachycardia of greater than 100/minute with a greater than 10mm Hg drop in blood pressure.
3) Access to peritoneal cavity: The operating surgeon described the access to peritoneal cavity as "easy" or "difficult".
4) Gall bladder bed dissection: The operating surgeon described GB bed dissection as "easy" or "difficult" depending upon difficulty in grasping/retracting GB, obscured anatomy of Calot's, adhesions, intrahepatic GB, anatomical variations.
5) Injury to (CBD/duodenum/small bowel/large bowel/ omentum/ liver), rupture of GB with spillage of stone/bile.
6) Difficult extraction: Extension of incision for extraction. The operating surgeon described GB extraction as "easy" or "difficult".
7) Conversion to open cholecystectomy (OC).

Statistical analysis

Univariate analysis was first performed using the chi-squared test to determine the factors that were associated with difficult LC, Next, a correlation matrix was developed to evaluate correlation between individual predators and significance was demonstrated in every case.

RESULTS

Out of 100 patients (26%) were in the age group of 41-50 years (Mean age:45.43). The sex ratio Female: Male was 69:31. In our present study BMI was less than 30 in 83% and 17% had a BMI more than 30. Difficulty in access to peritoneal cavity was encountered significantly more often in obese patients (p>0.05) and in patient had a history of abdominal surgery . 17% patients had a history of abdominal surgery. 20% patients had contracted GB while 8% had a distended GB. 32% patients had a GB thickness >3 mm. 81% had multiple stones on USG. Moderate bleeding during surgery occurred in 15 patients and none had severe bleeding out of which one required conversion. Dissection of GB bed was more often difficult in 15% of males in comparison to females (8%) . It was also observed that contracted GB, pricholecystic fluid, GB wall thickness and impactd stone at hartman's pouch dissection became difficult, in our study . Difficulty in GB extraction was there in 20 patients associated with BMI>30 and large size stone impacted with thickened gall bladder wall for which port site was enlarged. In 23% of patients laparoscopic cholecystectomy was difficult.

Four patients (4%) required conversion from LC to OC, because of the following reasons: dense adhesions with obscured calot's anatomy and moderate bleeding. On univariate analysis, factors which were significantly associated with conversion to OC; these included: patients having contracted GB, GB wall thickness >3mm, pericholecysticfluid and in male gender. A higher value of p indicates a higher likelihood of conversion, with a value of 1.0 indicating certainty of conversion to OC.

DISCUSSION

In this study we aimed to determine per operative risk factors that can be used to predict a "difficult cholecystectomy" and the risk of per-operative complication to optimize peri-operative management. Such prediction may allow a surgeon to be better prepared, to take extra precautions to reduce intra-operative complications, and to convert from LC to OC at an earlier stage. Conversion to OC is required in 2% to 15% of patients undergoing LC.[7,8] The need for conversion to laparotomy is neither a failure nor a complication, but an attempt to avoid complications and ensure patient safety[9] The risk of conversion to OC is related to surgeon factors, patient factors and, possibly, equipment factors. The most common reason for conversion in our study was inability to delineate the anatomy due to dense adhesions. Three factors, namely, past history of upper abdominal surgery, past history of acute cholecystitis, and greater thickness of the GB wall, were associated with difficulty in defining the anatomy.

Previous abdominal surgery poses problems during creation of pneumoperitoneum and during adhesiolysis to gain adequate exposure to the operative field; these problems depend in a large measure on the location of previous surgery. History of acute cholecystitis or acute pancreatitis results in a scarred and fibrosed GB, and in dense fibrotic adhesions leading to a difficulty in delineation of the anatomy.[10,11] The other two factors that significantly predicted the risk of conversion included BMI>30 kg/m2 and male gender. Obesity is known to make access to the peritoneal cavity difficult, thus necessitating conversion to open laparotomy.[12,13]

In this study 83% had BMI≤30, and 17% patients were having BMI>30, but there was significant association in obese patients with regard to Difficulty in access to peritoneal cavity and operative time (p>0.05).The reason for higher conversion rates in male patients remains unexplained, though male gender has been a significant risk factor in most series[8,14] It has been observed that male patients have more intense inflammation or fibrosis, resulting in more difficult dissection both in the triangle of Calot's and through the plane between the GB and the liver. In our study we encountered difficulty in access in ten patients. Although the other two factors were moderate bleeding and sessile gall bladder. Out of six patients who suffered moderate bleeding during surgery in the present study one with uncontrolled bleeding required conversion. Kama et al. (2001) reported 4 patients out of 1000 in which conversion was required due to uncontrolled hemorrhage.[15] Clinically significant bleeding occurs in 0.5% of LC.[16]

Ultrasonographic findings of thick GB wall (>3.5 mm) incurred a six fold increase in the conversion rates. In the present study thick GB was associated with difficult dissection, rupture of GB, increased incidence of bleeding, increased duration of surgery and increased rate of conversion. Contracted GB on ultrasound was associated with difficult dissection and also cause increased chances of conversion. Sharma et al. (2007) studied 200 patients undergoing LC also found cases with contracted GB on ultrasound had unclear Calot's and 3/42 patients required conversion.[17]

In our study difficulty in GB extraction was associated with size of GB stone, GB wall thickness, BMI>30 and extension of incision was required in 9 patients. Nachnani & Supe (2005) also concluded that difficulty in extraction was associated with a calculus of size more than 1 cm but not with number of stones.2 In Gabriel et al. (2009) study, a higher rate of conversion (34%) was seen in patients with multiple calculi. Sixty patients had GB wall thickness more than 3 mm, out of which 60% (n=41) had conversion.[18]

In a prospective study of 1676 patients, Fried et al. found that age, gender, acute cholecystitis, obesity, and thickened GB wall were significant predictors for conversion from LC to OC.[4] Patients with a high predicted risk of conversion could be operated on either by or under the supervision of a more experienced surgeon.8 Also, a high predicted risk of conversion may allow the surgeon to take an early decision to convert to OC when difficulty is encountered during dissection; this may shorten the duration of surgery and decrease the associated morbidity.[15]

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CONCLUSION

So, the clinical and ultrasonographic findings may help predict a difficult LC. This information may be useful to both the patient and the treating surgeon. The preoperative parameters that significantly predicted difficult LC were based on the clinical criterion of presence of local signs of cholecystitis in addition to ultrasonographic criteria of not only large stones but thick and fibrosed GB due to previous attacks of acute cholecystitis. However patients gender, body habitus, previous lower abdominal surgery, past history of jaundice, shape of GB and impacted stones had also significant effect on the course of surgery.

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