Preoperative Ultrasonography as a Predictor of Difficult Laparoscopic Cholecystectomy

Rajender Kumar[1]

[1]Assistant Professor, Department of Radiology, World College of Medical Sciences Research and Hospital, Jhajjar Haryana, India.

Abstract

Introduction: The most regularly done major abdominal treatment worldwide is laparoscopic cholecystectomy, which has quickly become the method of choice for routine gallbladder removal. The purpose of this study was to explore if preoperative ultrasonography could be used to predict whether or not a laparoscopic cholecystectomy would be difficult. **Subjects and Methods:** 78 patients with cholelithiasis were recruited from the World College of Medical Sciences Research and Hospital's surgical OPD and underwent elective laparoscopic cholecystectomy if they met all of the study's inclusion and exclusion criteria. **Results:** There were 78 instances analysed in all, with 22 cases (28.2%) being man and 56 cases (71.8%) being females. Twenty-five of the seventy-eight laparoscopic cholecystectomy operations (32.1 percent) were challenging. Gall bladder adhesions, difficult Calot dissection, leakage of bile and stones, bleeding obstructing vision, aberrant biliary tree anatomy, and intra-hepatic gall bladder were found in 94.6 percent and 89.4 percent of the 25 difficult laparoscopic cholecystectomy surgeries, respectively. **Conclusion:** The preoperative ultrasonography results of gallbladder wall thickness, pericholecystic collection, quantity of gall stones, impacted stones in gall bladder, and gall bladder transverse diameter can all be used to predict difficult laparoscopic cholecystectomy. The best modality for diagnosing gall stones is ultrasound, however it is operator-dependent. To obtain high-quality images and establish correct diagnoses, a high level of competence and experience is required.

Key Words: Ultrasonography, predictive factors and a difficult laparoscopic cholecystectomy.

INTRODUCTION

Cholecystectomy was first used to treat cholelithiasis in 1882, when its inventor Carl Johann August Langenbuch conducted the first cholecystectomy on a 43-year-old man who had been suffering from gallstone illness for the previous 16 years. Cholelithiasis (gall stone disease) is a well-known condition that affects people all around the world. Its annual incidence is predicted to be 1.39 per 100 people, with little variation between populations.[1] In 1987, Mouret pioneered laparoscopic cholecystectomy, which revolutionised the treatment of gallstone sufferers. Although laparoscopic cholecystectomy has several advantages, including reduced hospitalisation, reduced morbidity, shorter recovery time, and improved cosmesis,[2,3] it also has a higher risk of injury to the common bile duct (CBD), duodenum, bowel, iliac vessels, and other structures; a high conversion rate in acute cholecystitis; and difficulty managing concurrent CBD stones.[4,5] The most common screening test for cholecystitis and cholelithiasis is ultrasonography. For symptomatic gall stone disease, cholecystectomy is the preferred treatment. In the treatment of symptomatic gall stone disease, laparoscopic cholecystectomy (LC) has increasingly supplanted open cholecystectomy (OC) and is now considered the gold standard.[6] Better cosmetic outcomes, a shorter hospital stay, and a quicker return to physical activity and job have all contributed to this technique's appeal.[7] Acute cholecystitis, empyema, gangrenous gallbladder, cirrhosis patients and Mirizzi syndrome, previous

Address for correspondence*

Dr. Rajender Kumar,
Assistant Professor,
Department of Radiology,
World College of Medical Sciences Research and Hospital,
Jhajjar Haryana, India
Email: drrajenderchauhan@gmail.com

upper abdominal surgery, and severe obesity were all regarded contraindications to LC at first. The most popular noninvasive, safe, and highly accurate screening test for cholecystitis and cholelithiasis is ultrasonography. It can also assist surgeons in determining the level of difficulty that will be encountered during surgery on that particular patient.[8] Surgeons can choose situations that are appropriate for their expertise based on ultrasound data, lowering operating complications and reducing operative time. Specific preoperative parameters can consistently forecast the likelihood of conversion to an open procedure and the risk of certain problems based on ultrasonographic results, allowing the surgeon and the patient to mentally prepare.[9] The laparoscopic cholecystectomy (LC) is a highly common surgical procedure. Acute or chronic cholecystitis, adhesions from previous upper-abdominal procedures, Mirrizi's syndrome, and obesity are all prevalent clinical factors linked to difficult cholecystectomy. We examined and scored individuals who had difficult surgical exploration during laparoscopic cholecystectomy in this study. Difficult laparoscopic cholecystectomy (DLC) cases will be classed as Class I difficulty based on intraoperative findings: adhesion of the omentum majus, transverse colon, and duodenum to the gallbladder fundus. Adhesions in Calot's triangle and difficulty dissecting the cystic artery and cystic duct are both classified as Class II difficulties. Difficulty dissecting the gallbladder bed (class III difficulty) (scleroatrophic gallbladder, haemorrhage from liver during dissection of gallbladder, cirrhotic liver). Difficulty in exploring the gallbladder due to intraabdominal adhesions, including technical difficulties. The mainstay of therapy for cholelithiasis patients is laparoscopic cholecystectomy (LC). LC has been shown to be efficacious and safe in the treatment of symptomatic cholelithiasis in several randomised controlled trials and comprehensive reviews. When compared to open

cholecystectomy, the rapid acceptance of LC as the standard of therapy for patients with gallstones has been attributed to various benefits, including less patient morbidity, faster recovery, and shorter hospital stay. LC is one of the first laparoscopic operations that surgical students perform. Despite the development of official laparoscopic surgery training and advancements in laparoscopic technology, there is still a notion that performing LC in teaching institutions with a constant intake of trainees will result in difficult LC, increased conversion, and complication rates. While a variety of preoperative and operative risk variables have been linked to problematic LC and conversion to open cholecystectomy in multiple studies,[10,11] the performance of surgical trainees with various training backgrounds has not been properly addressed. Although conversion of LC to open cholecystectomy is a desirable outcome, it is currently less prevalent (2.6 percent–5.2 percent) than other difficultLC surrogate characteristics such as operational duration greater than 60 minutes, adhesions in the Triangle of Calot, cystic artery injury, or stone leakage.[12] The purpose of this study was to explore if preoperative ultrasonography can predict if a laparoscopic cholecystectomy will be difficult. The goal is to create an ultrasound-based grading system for predicting whether a laparoscopic cholecystectomy would be easy or difficult, as well as to compare it to surgical results.

MATERIALS AND METHODS

From January, 2016 to March, 2017, the present study was carried out in the Department of Radiology, World College of Medical Sciences Research and Hospital, Jhajjar, Haryana, India. 78 patients with cholelithiasis were recruited from the World College of Medical Sciences Research and Hospital's surgical OPD and underwent elective laparoscopic cholecystectomy if they met all of the study's inclusion and exclusion criteria. A single radiologist performed pre-operative ultrasonography on all cases under the identical settings. Between the ages of 26 and 72, Patients with symptomatic gallstone disease, including males and females. Patients who give their consent voluntarily will be included in the trial. The following individuals were not included in the study: Patients with a common bile duct stone, acute cholecystitis, acute pancreatitis, known carcinoma gallbladder, peritonitis, cholangitis, and conversion to open cholecystectomy due to equipment failure, anaesthetic complications, or the presence of other co-morbidities and contraindications to laparoscopic surgery were excluded from the study. The study will use the ultrasound findings of 78 patients. Four surgical parameters will be examined: time, biliary leakage, duct or artery injury, and conversion. Based on the criteria for challenging LC, LC is categorised as easy or tough. Based on DLC criteria, DLC will be categorised as class I to class IV. We'll look at the following ultrasonography findings: Pericholecystic collection, distended GB, impacted stones, numerous stones, CBD diameter, and liver size are all factors to consider.

RESULTS

The patients' mean age and SD were 42.52 ± 10.6 years. There were 78 instances analysed in all, with 22 cases (28.2%) being man and 56 cases (71.8%) being females. Twenty-five of the seventy-eight laparoscopic cholecystectomy operations (32.1 percent) were challenging. Gall bladder adhesions, difficult Calot dissection, leakage of bile and stones, bleeding obstructing vision, aberrant biliary tree anatomy, and intra-hepatic gall bladder were found in 94.6 percent and 89.4 percent of the 25 difficult laparoscopic cholecystectomy surgeries, respectively. A total of 5.1 percent of the 25 difficult laparoscopic cholecystectomies were converted to open cholecystectomy.

Table 1 shows the diagnostic accuracy of pre-operative ultrasonographic findings as well as the prevalence of complicated laparoscopic cholecystectomy.

| Gender distribution		Common Bile Duct Diameter	
Sex	**No. of patients(%)**	**3-4mm**	**8(10.3%)**
Male	22(28.2%)	4-5mm	25(32.1%)
Female	56(71.8%)	5-6mm	28(35.9%)
Wall thickness		6-7mm	17(21.8%)
1-2mm	24(30.8%)	Operating Parameters	
2-3mm	29(37.2%)	<1 hrs	52(66.7%)
3-4mm	10(12.8%)	1-2hrs	16(20.5%)
4-5mm	9(11.5%)	2-3hrs	10(12.8%)
5-6mm	6(7.7%)	>3hrs	00(0.0%)
Gall bladder transverse diameter		Biliary Leakage/Spillage of Stones	
2-3cm	45(57.7%)	Present	16(20.5%)
3-4cm	14(17.9%)	Absent	62(79.5%)
4-5cm	10(12.8%)	Adhesion In Triangle of Calot	
5-6cm	9(11.5%)	Present	27(34.6%)
Pericholecystic fluid		Absent	51(65.4%)
Present	16(20.5%)	Duct or Artery Injury	
Absent	62(79.5%)	Present	42(53.8%)
Impacted stones		Absent	36(46.2%)
Present	30(38.5%)	Conversion to Open	
Absent	48(61.5%)	Present	4(5.1%)
Multiple stones		Absent	74(94.9%)
Present	51(65.4%)		
Absent	27(34.6%)		
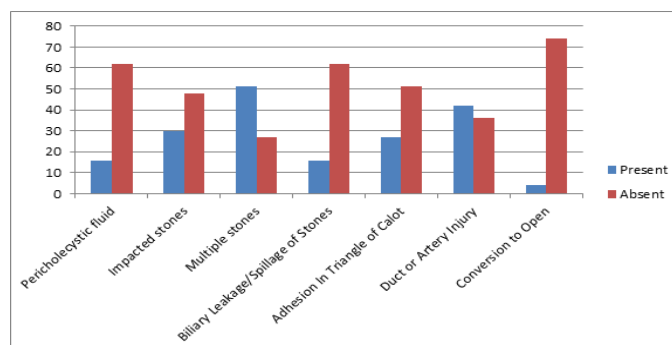
Figure 1: Preoperative ultrasonography diagnosis.

DISCUSSION

This present study was carried out in the Department of Radiology, World College of Medical Sciences Research and Hospital, Jhajjar, Haryana, India. The purpose of this study was to explore if preoperative Ultrasonography might predict if a laparoscopic cholecystectomy would be difficult. The goal is to create an ultrasound-based rating system for predicting whether a laparoscopic Cholecystectomy will be straightforward or difficult, as well as to compare it to surgical findings. Unlike western literature, there are no research on the predictive use of ultrasonography in Indian literature. The observation of gallbladder wall thickening is suggestive evidence of acute cholecystitis, according to Sanders RC, although it is not a

pathognomonic finding.[13] Mittalgodu In their study, Anantha Krishna Murthy Vivek, Alfred Joseph Augustine, and Ranjith Rao found that signs such as a distended or contracted gallbladder, intra-peritoneal adhesions, structural anomalies or distortions, and the presence of a cirrhotic liver are linked to subsequent surgical difficulties.[14] In his study, Serdar Yol, Adil Kartal, discovered that inflammation and fibrosis occur more frequently in men with symptomatic gallbladder stones than in women with the same condition. In male patients, this translates to more difficult dissections during laparoscopic cholecystectomy and a higher rate of conversion to open surgery.[15] Prior hospitalisation, BMI > 27.5, palpable gallbladder, thick gallbladder wall on USG, impacted stone at the neck, and pericholecystic collection are all major predictors of difficult laparoscopic cholecystectomy, according to Prashant S Dhanke and Subodh P Ugane's study. Furthermore, when the scoring system was used as a whole, the proposed scoring system had a positive prediction value of 91.6 percent for simple prediction and 100 percent for difficult prediction.[16] In their study, Urbano, D., Di Nardo, R., and De Simone found that preoperative investigations are ineffective in predicting biliary and vascular problems, which can be avoided by using proper surgical technique and a low conversion threshold.[17] Ravindra Nidoni, Tejaswini V Udachan,in there study That difficult laparoscopic cholecystectomy and conversion to open surgery can be predicted preoperatively based on number of previous attacks of cholecystitis, WBC count, Gall bladder wall thickness and Pericholecystic collection.[18] The study has some limitations. The study was conducted on a limited patient population of seventy-eight. Although ultrasound is the best modality for diagnosis of gall stones, it is operator-dependent. To obtain high-quality images and establish correct diagnoses, a high level of competence and experience is required. Although ultrasonography of the abdomen was conducted by a team of experienced sonologists in this investigation, some variation in the values of the ultrasonographic parameters was expected. With obese people, image quality and diagnosis accuracy are reduced because subcutaneous fat attenuates the sound beam, requiring a lower frequency transducer (with lesser resolution) and so affecting the values considered.

CONCLUSION

These findings suggest that, the preoperative ultrasonography results of gallbladder wall thickness, pericholecystic collection, quantity of gall stones, impacted stones in gall bladder, and gall bladder transverse diameter can all be used to predict difficult laparoscopic cholecystectomy. The best modality for diagnosing gall stones is ultrasound, however it is operator-dependent. To obtain high-quality images and establish correct diagnoses, a high level of competence and experience is required.

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