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Clinico-Radiological Factors Associated with Difficult Laparoscopic Cholecystectomy: A Prospective Study.

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Abstract

Aim: To identify clinical and radiological factors predictive of difficult laparoscopic cholecystectomy.

Background: Preoperative assessment is crucial for predicting surgical difficulty in laparoscopic cholecystectomy, optimizing surgical planning, and improving patient outcomes.

Methods: A prospective observational study was conducted on 90 patients undergoing elective laparoscopic cholecystectomy at a single institution. Clinical and radiological data, including demographics, medical history, laboratory findings, and ultrasound results, were collected. A predictive scoring system for surgical difficulty was developed, ranging from 0 (easy) to 15 (very difficult). Data were analyzed using IBM SPSS Stats 25.0.

Results: The study included 90 patients aged 15-70 years, with a predominance of females (77.8%). The mean BMI ranged from 18.5 to 30.0 kg/m², with 48 patients having a BMI below 25 kg/m². The mean predictive difficulty score was 0-7. Surgery difficulty was categorized as easy (most common), difficult (18.9%), and very difficult (5.6%). Factors significantly associated with increased surgical difficulty included age, BMI, prior hospitalization, comorbidities, and abdominal scars.

Conclusions: This study identified key clinical and radiological factors, including age, sex, prior hospitalization, and BMI, that predict difficult laparoscopic cholecystectomy using a developed scoring system. These findings can aid in preoperative planning and patient counseling, potentially reducing conversion rates and improving surgical outcomes.

Keywords: Laparoscopic cholecystectomy, surgical difficulty, predictive factors, preoperative assessment, scoring system.

Introduction

Laparoscopic cholecystectomy (LC) has become the gold standard surgical procedure for the treatment of symptomatic gallstone disease, offering significant advantages over traditional

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open cholecystectomy, including reduced postoperative pain, shorter hospital stays, and faster recovery. However, despite its minimally invasive nature, LC can present significant technical challenges, leading to increased operative time, higher complication rates, and the need for conversion to open surgery.The successful performance of LC relies heavily on the surgeon's skill, experience, and meticulous preoperative planning. Anatomical variations, such as a short cystic duct, dense adhesions from previous abdominal surgeries or inflammation, and a contracted or inflamed gallbladder, can significantly increase the technical difficulty of the procedure. These challenges can obscure the Calot's triangle, increase the risk of bile duct injury, and make dissection hazardous. Preoperative assessment plays a critical role in identifying patients at increased risk for difficult LC. This assessment typically involves a thorough clinical evaluation, including detailed medical history, physical examination, and appropriate radiological investigations. Ultrasonography (USG) is the primary imaging modality used to assess gallbladder pathology and identify potential risk factors, such as gallbladder wall thickness, the presence of pericholecystic fluid, and the presence of impacted stones. Identifying and predicting difficult LC preoperatively is crucial for several reasons. Firstly, it allows for better surgical planning, including the allocation of experienced surgeons and the availability of necessary equipment. Secondly, it facilitates more accurate patient counseling, enabling patients to make informed decisions about their treatment. Thirdly, it may reduce the conversion rate to open cholecystectomy, which is associated with increased morbidity and prolonged hospital stay. Several studies have attempted to identify clinico-radiological factors that predict difficult LC. These studies have reported various factors, including age, sex, body mass index (BMI), history of acute cholecystitis, previous abdominal surgery, and USG findings. However, the predictive value of these factors varies across studies, and there is no universally accepted scoring system for predicting difficult LC. Therefore, this prospective study aims to assess clinical and radiological factors that predict difficult LC in our institute. By identifying these factors, we hope to develop a clinically useful scoring system that can aid in preoperative planning, patient counseling, and ultimately improve the outcomes of LC. This study will contribute to the existing literature by providing a prospective analysis of a well-defined patient population and by evaluating the predictive value of a comprehensive set of clinico-radiological factors. The findings of this research may help to standardize preoperative assessment and improve the safety and efficiency of LC.

Materials and Methods:

This was a Prospective Observational study conducted at Department of General Surgery, Mamata Medical College, Khammam. over a period of September, 2011 to May, 2012. Total 90 Patients selected for Elective Laparoscopic Cholecystectomy and those with ultrasonographically proven cholelithiasis were included, while those with significant co-morbid illnesses or unfit for pneumoperitoneum creation were excluded. All Patients were informed about surgery procedures, demographic details, and prior medical history. They were evaluated for hematological, biochemical, immune, and urinary issues. Chest X-rays were obtained, and a USG whole abdomen assessment was performed. Results included demographics, clinical evaluations, laboratory findings, and USG findings. The patient’s pain episodes, palpable gallbladder, abdominal scar, palpable liver, and pain duration were noted. Laboratory findings included CBC, SGOT, SGPT, ALP, and lipid profile. The study used criteria to predict difficulty in laparoscopic cholecystectomy, with a total score of 5 - easy, 6-

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10 difficult, and >10 very difficult. Patients underwent the procedure, with pre-anesthesia screening and intraoperative variables such as time, stone spillage, and conversion to Statistical analysis Data analysis was performed using IBM SPSS Stats 25.0 software. Continuous data was represented as mean±standard deviation, while categorical/qualitative data was represented as numbers and percentages. Chi-square tests, ANOVA, and t-tests were used to compare data. The predictive value of the scoring system was assessed, including sensitivity, specificity, positive and negative predictive values.

Results

Total 90 patients aged 15-70 years, with a majority aged ≤50 years. The majority were female (77.8%), with 22.2% males. The mean BMI of the patients ranged from 18.5 to 30.0 kg/m2, with 48 patients having a BMI 27.1 kg/m2. The most common finding in patients with abdominal scars was wall thickness >4 mm, followed by previous hospitalization, impacted stone, and other factors. The surgery duration ranged from 25 to 95 minutes, with most patients undergoing less than 45 minutes. Intraoperative adhesions were present in 27.8% of cases, and extraction was difficult in 23.3%. Patients were classified as easy, difficult, or very difficult based on their level of ease of surgery. Total 90 patients undergoing laparoscopic cholecystectomy, it was found that 5.6% of patients were very difficult, while 17.8% were difficult. The majority of procedures were classified as easy (76.7%). The study found that patients who underwent easy surgery were younger (36.91±10.63 years) and had a higher ease of surgery (91.2%) compared to those who underwent difficult/very difficult surgery (68.2%). The proportion of difficult/very difficult surgery was higher in males (30.0% vs. 21.4%), but this difference was not statistically significant. The study found a significant trend in difficulty with increasing BMI, with a higher proportion of difficult/very difficult cases in cases without hospitalization history. The proportion of those without comorbidities was higher in easy procedures (94.2%) compared to difficult procedures (28.6%). The presence of a supraumbilical scar also showed a significant association with difficulty (p4 mm and those with impacted stones. The majority of cases with Mucocele/Pyocele detected on USG had difficult/very difficult surgery (90.0%), while the majority of cases without purulent collection had easy surgery (85.0%). This difference was statistically significant. A pre-operative scoring system for difficult laparoscopic cholecystectomy was developed using demographic, clinical, laboratory, and USG findings. The system ranged from 0-5 to 11-15 difficult surgeries, with a mean predictive score of 0-7 for easy surgery and 2-12 for difficult/very difficult surgery. The majority of surgeries were predicted as easy, followed by difficult (18.9%) and very difficult (5.6%). The study found that 66 out of 68 patients predicted as easy underwent surgery easily, with 66 (97.1%) being difficult to operate. The majority of the 17 patients predicted as difficult were difficult during surgery, with all five patients predicted as very difficult being very difficult intraoperatively. Demographic and clinical variables such as age, BMI, hospitalization history, comorbidities, and presence of supraumbilical abdominal scars were associated with ease of surgery. USG findings also showed significant associations with ease of surgery. The predictive score based on clinical, laboratory, and radiological findings showed significant associations with ease of surgery.

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Discussion

This prospective study aimed to identify clinico-radiological factors predictive of difficult laparoscopic cholecystectomy (LC) in our institute, utilizing a developed scoring system. The findings revealed that several factors, including age, BMI, prior hospitalization, comorbidities, and abdominal scars, were significantly associated with increased surgical difficulty. The predominance of female patients in our cohort (77.8%) is consistent with the established epidemiological pattern of gallstone disease. This demographic distribution underscores the importance of considering sex-specific factors in preoperative assessments. The observation that increased age and BMI were associated with higher surgical difficulty aligns with previous studies. Older patients often present with comorbidities and altered anatomy, contributing to technical challenges during LC. Similarly, higher BMI, particularly central obesity, can obscure surgical planes and increase the risk of complications. Prior hospitalization, especially for acute cholecystitis, and the presence of comorbidities were also significant predictors of difficult LC. Acute inflammation can lead to dense adhesions and fibrosis, making dissection challenging. Comorbidities may necessitate a more cautious surgical approach and increase the risk of intraoperative complications. Abdominal scars from previous surgeries are known to create adhesions that can distort anatomy and increase the difficulty of laparoscopic access and dissection. This finding emphasizes the importance of a detailed surgical history during preoperative evaluation. The developed scoring system, ranging from 0 (easy) to 15 (very difficult), provided a structured approach to predicting surgical difficulty. The majority of surgeries were predicted to be easy, reflecting the overall safety and feasibility of LC. However, a significant proportion of patients (18.9% difficult, 5.6% very difficult) were identified as high-risk, highlighting the importance of preoperative risk stratification. The mean predictive difficulty score of 0-7 suggests that our scoring system effectively identified patients at increased risk. This scoring system, incorporating demographic, clinical, laboratory, and USG findings, can serve as a valuable tool for preoperative planning and patient counseling. Several limitations should be acknowledged. Firstly, this was a single-center study, which may limit the generalizability of the findings. Multi-center studies with larger sample sizes are needed to validate the predictive value of the identified factors and the developed scoring system. Secondly, the assessment of surgical difficulty was subjective, relying on the surgeon's intraoperative assessment. Objective measures, such as operative time and conversion rate, could provide a more standardized evaluation. Thirdly, the study did not explore all potential predictors of difficult LC, such as specific USG findings (e.g., gallbladder wall thickness, pericholecystic fluid). Despite these limitations, this study provides valuable insights into the clinico-radiological factors predicting difficult LC. The developed scoring system can aid in preoperative planning, patient counseling, and potentially reduce conversion rates. By identifying high-risk patients, surgeons can take appropriate precautions, such as allocating experienced personnel and ensuring the availability of necessary equipment. Future research should focus on validating the developed scoring system in larger, multi-center studies. Objective measures of surgical difficulty should be incorporated, and the predictive value of specific USG findings should be explored. Additionally, the impact of preoperative interventions, such as antibiotics and steroids, on surgical difficulty and outcomes should be investigated. In conclusion, this prospective study identified key clinico-radiological factors that predict difficult LC. The developed scoring system can serve as a valuable tool for preoperative risk stratification, potentially improving surgical outcomes and patient satisfaction. Further research is needed to validate these findings and refine the scoring system for wider clinical application.

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