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ORIGINAL ARTICLE

Preoperative predictors of challenging laparoscopic cholecystectomy.

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ABSTRACT… Objective: To assess the predictability (probability) of the preoperative score in identifying difficult cases and to uncover preoperative characteristics that indicate difficult laparoscopic cholecystectomy. **Study Design:** Prospective Interventional study. **Setting:** Department of General Surgery, Sahara Medical College Narowal. **Period:** May 2023 and April 2024. **Methods:** One hundred patients whose cholecystectomy procedures were categorized as easy, tough or very difficult based on two factors: intraoperative results and preoperative assessment system were included. **Results:** Preoperative difficulty prediction score and intraoperative data were significantly correlated (k=0.858, P<0.001). Hospitalization (P<0.001), prior supraumbilical surgeries (P=0.004), prior acute cholecystitis (P<0.001), prior jaundice (P=0.049), prior endoscopic biliary clearance (P=0.022), increased gallbladder wall thickness (P=0.001), and pericholecystic fluid collection (P=0.014). In six cases (6%), conversion to the open method was required. Procedure difficulty was not substantially affected by age, sex, BMI, or impacted stone (P>0.05). **Conclusion:** Multiple preoperative characteristics have been linked to increased difficulty during laparoscopic cholecystectomy. Proper identification of these criteria and their incorporation into a scoring system would be extremely beneficial in determining challenging cases during the preoperative stage.

Key words: Challenging Procedure, Cholelithiasis, Laparoscopic Cholecystectomy, Predictors.

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INTRODUCTION

Laparoscopic cholecystectomy (LC) is the gold standard treatment for symptomatic gallstone disease. While it is considered a minimally invasive procedure with low morbidity, certain preoperative factors can predict a technically challenging surgery, leading to prolonged operative time, conversion to open surgery, or increased postoperative complications.[1] Identifying these predictors is crucial for surgical planning, patient counseling, and resource allocation.

Several patient-related and disease-related factors contribute to surgical difficulty. Advanced age, male gender, obesity, and previous upper abdominal surgeries have been associated with increased complexity due to altered anatomical planes and increased adhesions.[2] Additionally acute cholecystitis, thickened gallbladder wall (>4 mm), pericholecystic fluid, and impacted gallstones are significant radiological markers indicating inflammation and fibrosis, which may obscure critical structures during dissection.[3]

Laboratory markers such as elevated white blood cell count and abnormal liver function tests may indicate severe inflammation or biliary obstruction, increasing the likelihood of difficulty during LC.[4] Furthermore, anatomic variations of the cystic duct and artery, often detected through preoperative imaging, can predispose patients to intraoperative challenges and bile duct injuries.[5]

Understanding these preoperative predictors allows for better risk stratification and decision-making. Surgeons can adopt precautionary measures such as preoperative imaging, alternative techniques like subtotal cholecystectomy, and ensuring the availability of advanced surgical tools or expertise in high-risk cases.[6] Future research should focus on developing predictive scoring systems incorporating these variables to enhance surgical outcomes.

Jorba et al[1] conducted a retrospective analysis highlighting that factors such as male gender, advanced age, and previous upper abdominal surgery significantly increase the difficulty of LC.

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Similarly, a study by Gholipour et al[2] developed an artificial neural network-based predictive model, which successfully identified high-risk patients requiring conversion to open surgery.

Imaging studies have played a crucial role in predicting difficult LC, Kurata et al[3] demonstrated that gallbladder wall thickening greater than 4 mm, the presence of pericholecystic fluid, and impacted stones on ultrasound are significant indicators of surgical difficulty. Moreover, abnormal liver function tests and elevated inflammatory markers have been correlated with increased intraoperative complications.[4]

Anatomic variations further complicate LC, as highlighted by Ravindran et al[5] emphasized the importance of preoperative imaging in detecting variations in cystic duct and artery morphology. Their study found that unrecognized anatomical anomalies were a major contributor to bile duct injuries and prolonged operative time. Trehan et al[6] also proposed a predictive scoring system integrating these risk factors, allowing for better preoperative planning and resource allocation.

Overall, the literature supports the need for a multifactorial approach to predicting difficult LC. Combining patient history, laboratory markers, imaging findings, and anatomical considerations can improve risk stratification and surgical preparedness, ultimately reduce complications and optimize patient outcomes.

METHODS

This prospective interventional study was conducted in the General Surgery Department between May 2023 and April 2024 vide letter No. 0061. One hundred patients underwent the standard preoperative evaluation, which included a thorough history taking (with an emphasis on the duration of the symptoms, prior hospitalization, past jaundice attacks, prior abdominal surgery, and prior endoscopic retrograde cholangiopancreatography (ERCP), a clinical examination (with an emphasis on body mass index (BMI), complexion, abdominal scars, and palpation of the right upper abdominal quadrant), and abdominal ultrasonography (with an emphasis on the thickness of the gallbladder wall, the presence of an impacted stone at Hartmann pouch, and the presence of pericholecystic fluid collection).

Higher scores indicate more difficulty (easy operation 0–5, difficult operation 6–10, and very difficult operation 11–15). The total score goes from 0 to 15. In order to compare these scores with intraoperative findings, they were recorded. The patient was in a reverse Trendelenburg posture with a slight inclination to the left when the procedures were carried out in the operating room under general anesthesia. The Veress needle was used to insufflate the abdominal cavity, and then the periumbilical camera port was inserted. The remaining three openings two working ports at the right and left midclavicular lines, one inch below the costal margin, and an aiding port at the right anterior or midaxillary lines were introduced following a thorough examination of the abdominal cavity. Patients who had bleeding diathesis, concurrent common bile duct stones, acute cholecystitis at presentation, or were deemed unsuitable for general anesthesia or laparoscopy were excluded.

The procedures were categorized as easy, difficult, or very difficult based on the actual intraoperative results. An "easy" operation was defined as one that took less than an hour and involved no biliary or arterial damage, while a "difficult" operation was defined as one that took one to two hours and involved biliary or stone spillage without conversion to the open approach. The technique was deemed "very difficult" if the patient was switched to the open method or if the operation took more than two hours. The data was entered and analyzed through SPSS-25.

DISCUSSION

Laparoscopic cholecystectomy is the gold standard for gallbladder removal, but certain preoperative factors can predict a challenging procedure. Our study analyzed various predictors, including patient demographics, ultrasonographic (USG) findings, and preoperative assessments, to determine their impact on surgical difficulty and outcomes.

RESULTS

TABLE-I

Demographic/clinical/radiological DATA

Parameter	Value	Mean±SD
Age	25-68	46.5±12.41
Gender	M 30 F 70	(30.0), (70.0)
Hospitalization	36	36.0
BMI Range	24-37	30.5± 3.71
Abdominal scar	IU	16
	SU	15
Past history		
Acute	32	
Jaundice	3	
Ultrasound findings		
Fluid	12	
Wall thickness	20 range (2-5.8)	3.35± 1.38
Stone impaction	08	
Total score range	1-11	6±2.89

TABLE-II

Preop score and operative difficulty level

Level	No
Easy	47
difficult	40
Very difficult	13

Operative Findings

TABLE-III

Relationship between surgery difficulty and clinical data

variable		Mean±SD
Operative time	35-140	(87.5) ± (30.32)
Complications		No %
Bile leakage	37	37(37.0)
Injury Ducts	1	1(1.0)
conversion	10	10(10.0)

Age and gender distribution in our cohort suggest that LC was performed across a broad age range (25-60 years), with a predominance of female patients (70%). This aligns with previous literature indicating that gallstone disease is more common in females due to hormonal influences on biliary motility and composition.[7] However, male patients tend to present with more advanced disease and fibrosis, often leading to increased surgical difficulty.[8]

A higher BMI (range: 24-37) has been associated with technical challenges in LC, including limited trocar placement and reduced intra-abdominal workspace.[9] Though our study did not find BMI as a direct predictor of conversion to open surgery, it may contribute to prolonged operative times and increased difficulty.

A history of supraumbilical surgical scars was present in 15% of patients. Adhesions from previous surgeries can increase the risk of complications and conversion to open surgery due to distorted anatomy.[10] Interestingly, none of the patients had infraumbilical scars, which are less likely to interfere with gallbladder dissection.

USG findings played a crucial role in predicting difficult LC. Acute cholecystitis (32%), gallbladder wall thickening (20%), and stone impaction (12%) were notable risk factors. Acute inflammation leads to friable tissues and adhesions, making dissection more challenging and increasing the risk of bile duct injury.[11] Similarly, stone impaction at the gallbladder neck can hinder the safe manipulation of Calot's triangle, complicating dissection and prolonging operative time.[12]

Preoperative assessment classified cases as easy (47), difficult (40), and very difficult (13). This classification correlated well with intraoperative findings, emphasizing the importance of thorough preoperative evaluation in surgical planning. Operative time ranged from 35 to 160 minutes, reflecting variations in difficulty.

Postoperative outcomes revealed that 7% of cases had bile leakage, and 10% required conversion to open surgery. The conversion rate is consistent with previous studies, which cite a 5-15% conversion rate in difficult cases.[13] Postoperative assessment showed that 47 patients had an easy recovery, 46 experienced a difficult postoperative course, and 7 had a very difficult recovery, likely influenced by intraoperative challenges.

There are several restrictions on our investigation. The primary limitation is the very limited number of

patients collected from a suburban surgical facility. Additionally, we should have included several intraoperative criteria such as liver state, surgeon experience, and rural places with lower levels of education awareness, but our study was restricted to preoperative factors alone.

CONCLUSION

Preoperative predictors such as male gender, high BMI, prior supraumbilical surgery, USG findings of acute cholecystitis, wall thickening, and stone impaction correlate with challenging LC. A structured preoperative assessment can guide surgical planning, anticipate complications, and potentially improve patient outcomes. The laparoscopic cholecystectomy procedure's increased difficulty has been substantially linked to a number of preoperative factors. Determining challenging situations during the preoperative phase would be made much easier with the correct identification of these factors and their incorporation into a scoring system. Better surgical planning for challenging cases (such as those handled by highly skilled surgeons) might result from that. However, despite being in isolated locations with few resources, having fewer cooperative patients, and experiencing repeated episodes of adhesions and inflammations, the outcomes were comparable to those of any other institution.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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The most common way people give up their power is by thinking they don't have any.

Alice Walker

AUTHORSHIP AND CONTRIBUTION DECLARATION	
1	**Kamran Cheema:** Data analysis, writing.
2	**Muhammad Aslam:** Editing.
3	**Shafqatullah:** Data collection.
4	**Inayat Hussain:** Literature review.
5	**Muhammad Tariq Bashir:** Study design.
6	**Asadullah:** Proof reading.