Original Article

To Assess the Validity of Preoperative Scoring System in Difficult Laparoscopic Cholecystectomy

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Abstract

Background: Laparoscopic cholecystectomy (LC) is the gold standard treatment for cholelithiasis. Furthermore, in comparison to traditional open cholecystectomy, laparoscopic cholecystectomy offers minimal invasive technique, reduced postoperative pain, quicker recovery, an earlier return of bowel function, and a shorter hospital stay. However a surgeon may encounter difficult cases which can increase the risk of complications, Various Scoring system are used to determine the pre operative predictability of difficult laparoscopic cholecystectomy. In our study we studied Randhawa and Pujahari scoring system and assessed its senstivity and specificity, whether this scoring system is valid or not.

Conclusion: In our study done at Sri Guru Ramdass University of health sciences and research we took 100 cases and predicted whether the laparoscopic cholecystectomy will be easy or difficult o n the basis of Randhawa and Pujahari scoring system and compared the scores with the surgical outcome whether it was easy or difficult laparoscopic surgery. In our study while assessing the validity of Randhawa and Pujahari scoring system positive predictive value came 90% and negative predictive value of 86.6% with sensitivity and specificity of 81.82% and 92.86%

Keywords: Difficult Laparoscopic Cholecystectomy (DLC), Scoring Systems, Validity, Risk Factors.

Introduction

Laparoscopic cholecystectomy (LC) is the gold standard treatment for cholelithiasis. Furthermore, in comparison to traditional open cholecystectomy, laparoscopic cholecystectomy offers minimal invasive technique, reduced postoperative pain, quicker recovery, an earlier return of bowel function, and a shorter hospital stay.[1]

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Laparoscopic cholecystectomy has many benefits, but it is not without risks. Numerous complications can arise during laparoscopic surgery; some are specific to this particular technique, while others are typical of laparoscopic surgery in general. For a variety of reasons, between 2% and 10% of patients require conversion to open surgery.[2]Common bile duct injury, bile leakage, gallbladder perforation, damage to the vascular and visceral structure during the use of a trocar and Veress needle, and additional complications like external biliary fistula, perihepatic collection, wound sepsis, hematoma, adhesions, foreign body inclusions, metastatic port-site deposits, and cholelithoptysis are among the complications that can arise.[3]Risk factors that increase the complexity of laparoscopic cholecystectomy include preoperative and intraoperative variables like age, body mass index (BMI), male gender, history of abdominal surgery, acute cholecystitis with fever, leucocytosis, presence of gallbladder stones, and specific ultrasonography findings like gallbladder distention and wall thickness ≥4 mm, impacted gallstones, and pericholecystic fluid collection.

Since it was initially described in 1985, laparoscopic cholecystectomy has been the accepted procedure for treating benign biliary diseases. These days, cholecystectomies are among the most common surgical procedures worldwide. Due to the learning curve, there was an increased risk of bile duct injuries and complications during the early stages of the laparoscopic technique's development. However, over time, the percentage of serious lesions dropped from 0.08 to 0.12% and 1.5% of all lesions. The complexity of cholecystectomy has been linked to subsequent events.[4]

Even though LC is the most frequently performed operation these days, conversion is necessary for some intended LC for a variety of reasons. It often takes longer than expected and necessitates conversion to an open cholecystectomy because of intraoperative complications that must be addressed for the procedure to end safely. Nonetheless, a conversion rate of roughly between (2% and 10%) has been reported in recent literature.[5]

Between 2 and 15% of cases of laparoscopic cholecystectomy were converted to open procedures in the early years of the procedure. The conversion rate fell to roughly 1–6% following years of studying and mastering the laparoscopic technique and increasing surgeons' experience. This conversion was an attempt to steer clear of issues brought on by a number of procedural challenges. Cases of dense adhesions at Calot's triangle, upper abdominal surgery history, acutely inflamed and gangrenous gallbladder, gallbladder empyema, Mirizzi's syndrome, prior cholecystostomy, and cholecystogastric or cholecystoduodenal fistula are taken into consideration when determining difficulty.[6]

The majority of the time, it's difficult to gauge the degrees of difficulty. However, forecasting is required in order to inform the patient about the likelihood of conversion. Similarly, the surgeon can mentally prepare for the challenging cholecystectomy in order to improve postoperative outcomes. This preparation can include having a strong surgical team, planning the procedure appropriately, performing an intraoperative cholangiogram, and being ready overall. Knowing the predictors for completing such difficult surgeries is always preferable. The likelihood of potential complications and conversion to open surgery can be estimated based on risk factors such as patient demographics (age, gender, body weight, comorbidity, and ASA score), clinical findings (acute versus chronic cholecystitis), and the surgeon's experience.[7]

A study using six parameters—old age, male gender, upper abdominal tenderness at the time of surgery, thickened gallbladder wall detected sonographically, and preoperative diagnosis of acute cholecystitis—was reported by Kama et al. and was found to be significantly associated with the risk of open cholecystectomy.[8]

There are a number of factors that have been identified that could affect how difficult a cholecystectomy is. These include factors related to the patient, like age, sex, anatomical variations, prior surgeries, obesity, or pathologies like severe inflammation or impacted stones. External factors, like malfunctioning equipment, could also have an impact.[9]

There are multiple studies done to predict the pre operative difficulty in laparoscopic Cholecystectomy as our study was done in indian framework Jaskiran S. Randhawa. Aswini K. Pujahari predictive score study is more preferable, As a result, the objective of this study is to access the validity of the Jaskiran S. Randhawa. Aswini K. Pujahari predictive scoring system. This study will define the precision of the scoring system that predicts the pre operative difficulty of laparoscopic cholecystectomy. By calculating the precision of this scoring system, we will find out about the rationality of this scoring system, as this scoring system allow us to define difficulty in LC pre operatively which makes outcome predictable.

Materials and Methods:

Study Period: 01st January 2023 to 31st March 2024.

Study Design: Prospective observational study.

Number of cases: 100

Informed Consent was taken from all the patients for this study.

Methodology

All the patients above 18 years, for symptomatic gallbladder disease were included in the study. All the cases were given scores on the basis of Randhawa and Pujahari scoring system, on the basis of this scoring system cases were assigned as easy, difficult and very difficult pre operatively. The following parameteres were used to measure the outcome of surgery:

1. Time taken for surgery
2. Bile/stone spillage
3. Injury to cystic duct or cystic artery
4. Conversion to open cholecystectomy

ETHICAL APPROVAL STATEMENT

The study was ethically approved by Sri Guru Ram Das Institute of Medical Sciences and Research, Sri Amritsar Date - 10-10-2022 and Ref no SGRD/IEC/22-93

RANDHAWA AND PUJAHARI SCORING SYSTEM FOR DIFFICULT LAPAROSCOPIC CHOLECYSTECTOMY

Scoring factors	Minimum	Maximum	Total
History Age Sex	<50 years(0) Female (0)	>50 years (1) Male(1)	1 1
History of hospitalization for acute cholecystitis/ pancreatitis Clinical	No (0)	Yes(4)	4
BMI weight(kg/height(m^2)	<25(0)	25-0-27.5(1) >27.5(2)	2
Abdominal Scar	No (0)	Infa- umbilical(1) Supra- umbilical(2)	1 2
Palpable GB Sonography	No (0)	Yes(1)	1
Wall thickness	Thin (0)	Thick> 4mm (2)	2
Pericholecystic collection	No (0)	Yes(1)	2
Impacted stone	No (0)	Yes(1)	1

Preoperative risk based on the scoring system

Risk	Score
No Risk	0-5
Moderate	6-10
High Risk	11-5

PARAMETERS OF DIFFICULT LAPAROSCOPIC CHOLECYSTECTOMY:

Parameters	Easy	Difficult	Very Difficult
Times taken for surgery	<60 min	60-120 min	>120min
Bile/stone spillage	No	Yes	Yes
Injury to duct or artery	No	Yes	Yes
Conversion to open cholecystectomy	No	No	Yes

Inclusion Criteria

Patients above 18 years with symptomatic gallbladder disease

Exclusion Criteria.

1. Patients with gallbladder carcinoma
2. Peritonitis
3. History of upper quadrant surgeries in the past
4. Coagulopathies
5. Portal hypertension
6. Pregnancy (excluding second trimester)

Results

In our study we took 100 cases and predicted there surgical outcome on the basis of Randhawa and Pujahari scoring system and compared the outcome of the surgery with prediction score. Surgical outcome was measured on the basis of following parameters:

1. Time taken for surgery
2. Bile/stone spillage
3. Injury to cystic duct or cystic artery
4. Conversion to open cholecystectomy

On the basis of Randhawa and Pujahari scoring system out of 100 cases 60 were predicted easy and 40 were predicted difficult and in our result out of these 60 easy predicted cases 52 were easy and 8 were difficult, out of 40 predicted difficult cases 34 cases came out to be difficult, 4 cases came out to be easy 2 very difficult and

Table No 1: Co-relation of predictive outcome with the final outcome

Co-relation of predictive outcome with the final outcome	Pre-operative prediction	Easy outcome	Difficult outcome	Very Difficult Outcome	R value
Easy	60	52	8	0	0.758
Difficult	40	4	34	2	
Total	100	56	42	2	

Spearman's rho correlation; R value = 0.758; p <0.001; Highly significant

Table No 2: Surgical outcome in study

Risk factor	Level	Easy	Difficult	Very Difficult	P Value
Sex	Female 71	39(54.9%)	32 (45.0%)	0 (.0%)	.00005
	Male 29	5(17.2%)	22 (75.8%)	2 (6.9%)	
Age	<50 (68)	28(41.17%)	40(58.8%)	0.00%	0.062
	>50 (32)	16(50.0%)	14(43.7%)	2(6.03%)	
BMI	100	44(44%)	54 (54%)	2 (2%)	.0002

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History of previous Pancreatitis/Cholecystitis	No (57)	43(75.00%)	14(25.00%)	0.00%	.0001
	Yes (43)	1(2.32%)	40(93.02)	2(4.50%)	
Palpable Gall Bladder	No (92)	44(47.82%)	48(52.1%)	0.00%	0.003
	Yes (8)	0.00%	8(100%)	0.00%	
History of Previous Abdominal Surgeries	Supra Umbilical (19)	6(31.5%)	13(68.4%)	.0%	.486
	Infra Umbilical (26)	12(46.1%)	14(53.8%)	.0%	
Gallbladder wall thickness	No	43(57.3%)	30(40.0%)	2(2.7%)	0.0001
	Yes	1(4.0%)	24(96.0%)	0%	
Impacted Stone	No (75)	41(50.0%)	41(50.0%)	.0%	0.0008
	Yes (25)	3(16.6%)	13(72.2%)	2(11.1%)	
Pericholecystic fluid collection	No (94)	43(45.7%)	49(52.1%)	2(2.1%)	0.328

Chi square test; $p<0.05$ is significant; $p<0.001$; Highly significant

Table no 2 shows comparison of preoperative risk factors and surgical outcome in the present study. The relationship between sex and surgical outcome is significant. The relationship of BMI with surgical outcome is significant. The relationship between history of pancreatitis, palpable gall bladder and surgical outcome is significant. The relationship between history of previous abdominal surgeries is not significant as. The relationship between gall bladder wall thickness, impacted stone is significant. The relationship between pericholecystic fluid collection and surgical outcome is non-significant.

Discussion

Laparoscopic cholecystectomy (LC) has become the gold standard for treating symptomatic gallstones and other gallbladder disorders due to its minimum invasiveness, reduced postoperative discomfort, shorter hospital stays, and faster recovery time compared to open surgery. Certain instances, known as "difficult laparoscopic cholecystectomy" (DLC), pose major technical obstacles. Preoperative grading methods have been created to estimate the complexity of LC, which helps with surgical planning and patient counselling.[50] To help surgeons make decisions and manage patients, these scoring systems take into account a variety of preoperative criteria. These scoring methods assist with risk stratification of patients and surgery planning by assessing characteristics such as the degree of inflammation, adhesion presence, anatomical abnormalities, and comorbidities.

These scoring systems have various benefits when used in challenging laparoscopic cholecystectomy procedures. It lowers the subjectivity in surgical decision-making by enabling a consistent and objective assessment of patient factors. Surgeons can potentially lower the risk of intraoperative complications, optimize resource allocation, and customize their strategy by identifying high-risk patients. Preoperative risk classification also makes it possible to have discussions with patients about informed consent and to set reasonable expectations for the surgical process and its results.

These methods are helpful in complex laparoscopic cholecystectomy procedures, but it's important to recognize their limitations. These grading methods rely on preoperative evaluations, which might not always precisely represent the results of the intraoperative procedures.

There are many preoperative scoring methods, in our study we studied the validity of Randhawa and Pujahari scoring system.[10]

In our study, 100 patients had laparoscopic cholecystectomy, and we took Randhawa and

Pujahari study's prognostic risk factors for difficult laparoscopic cholecystectomy. Sex, BMI, history of hospitalization, abdomen pain, previous abdominal surgery, palpable gall bladder, and ultrasonographic findings like gall bladder wall thickness, pericholecystic fluid collection, impacted stone were included as risk factors in this study.

Randhawa and Pujahari[10] scoring system included age more than 50 as a risk factor but results were non significant. However in our study age more than 50 was considered as a difficult predictor for Difficult LC. 32 patients had age more than 50 who were predicted of DLC, Out of which 14 turned out to be difficult and 2 turned out to be very difficult LC, rest of the 16 cases had easy outcome. Statistically there is a significant association between age> 50 and outcome of surgery.(p value <0.05).

According to Randhawa and Pujahari[10] scoring System, male sex was considered as a risk factor for DLC. Laparoscopic cholecystectomy can be more challenging in older patients because of lower physiological reserve, altered anatomical features, and an increased risk of comorbidities. IN our Study 29 were male and 71 were females. out of 29 male cases 22 cases had Difficult LC and 2 had very Difficult LC. In our study there was a significant association of male sex with difficult laparoscopic cholecystectomy with p value<0.05 however there was no significant relation between age and surgery outcome according to Randhawa and Pujahari score.

According to Randhawa and pujahari's[10] scoring system patients with HIGH BMI are considered under DLC. In our study 42 patients had BMI > 25 which is considered as a risk factor for DLC, out of which 28 patients had DLC and 2 patients had Very DLC and had to underwent open cholecystectomy. There was significant association seen between high BMI and difficult laparoscopic cholecystectomy. (P value <0.05).

Pujahari and Randhawa's[10] model have mentioned previous history of abdominal surgery as a risk factor but did not find any significant correlation, same came in our result. The p value came >0.05(p value = 0.483) which is non significant.

Pujahari and Randhawa's studies found that a clinically palpable gallbladder was linked to a challenging laparoscopic cholecystectomy. In our study out of 100 cases 8 cases had clinically palpable gallbladder, out of which all the 8 cases had difficult laparoscopic cholecystectomy but out of 92 patients with no palpable gall bladder 44 had easy LC AND 48 had DIFFICULT LAPAROSCOPIC CHOLECYSTECTOMY. The p value came out to be <0.05 showing significant correlation between palpable gall bladder and difficult surgical outcome.

Both cholecystitis and pancreatitis are considered as a risk factor in Pujahari and Randhawa's studies and both came out to be significant factors for outcome of surgery. Dissection may be more difficult in patients with a history of pancreatitis due to inflammatory alterations in the periportal area and surrounding tissues. In our study previous history of cholecystitis and pancreatitis showed significant association with difficult laparoscopic cholecystectomy with p value <0.05.

Agrawal and Randhawa's study considered thickness of more than 4mm as a preoperative predictor of difficult laparoscopic cholecystectomy and results showed significant association between gall bladder thickness >4mm and difficult laparoscopic cholecystectomy .In our study ultrasound proven gall bladder thickness>4mm was seen in 25 patients out of 100 , out of these 25 patients 24 had difficult laparoscopic cholecystectomy. There was a significant association of gallbladder thickness with difficult laparoscopic cholecystectomy with p value <0.05.

In our study Impacted stones showed a significant association with a p value <0.05 whereas Pujahari and Randhawa scoring system gave no significant correlation between impacted stone and outcome of surgery.

In both Pujahari and Randhawa's[10] study and our study accumulation of pericholecystic collection did not showed any significant association with difficult laparoscopic cholecystectomy (p value >0.05).

Two patients required conversion to open cholecystectomy because of difficult anatomy, the factors associated with conversions were male sex, past history of cholecystitis/pancreatitis, Gall bladder thickness >4mm, Impacted stones and BMI >27.5. This variation can be attributed to the surgeon-to-surgeon variations, the underlying prognostic determinants of the individual, lack of uniform

evaluating system, and difference in sample size. The experience of the surgeons and time spent in perfecting the surgical techniques help in achieving a low rate of complications.

It is crucial to recognize the limits of the Randhawa scoring system even though it provides insightful information about the anticipated complexity of a laparoscopic cholecystectomy. The preoperative evaluations and imaging investigations that the scoring system depends on do not always fully reflect the scope of intraoperative difficulties. Because unforeseen complications may develop during surgery that were not fully anticipated in the preoperative scoring system, surgeons should be adaptable and ready to modify their technique depending on real-time discoveries.

Conclusion

In our study done at Sri Guru Ramdass University of health sciences and research we took 100 cases and predicted the difficulty score on the basis of Randhawa and Pujahari scoring system and compared the scores with the surgical outcome whether it was easy or difficult laparoscopic surgery. Out of 100 cases 60 cases were predicted for easy laparoscopic cholecystectomy and 40 were predicted for difficult laparoscopic cholecystectomy. However, in final outcome out of 40.difficult predicted cases 36(90.0%)came out to be difficult laparoscopic cholecystectomy and out of 60 easy predicted cases 52(86.6%) came out to be easy. Hence in our study while assessing the validity of Randhawa and Pujahari scoring system positive predictive value came 90% and negative predictive value of 86.6% with sensitivity and specificity of 81.82% and 92.86%.

In conclusion, the Randhawa and Pujahari[10] scoring system is a useful tool for risk assessment and surgical planning in complicated laparoscopic cholecystectomy situations. Surgeons can forecast the complexity of a surgical treatment and adjust their approach accordingly by using the Randhawa scoring system, which integrates several clinical and radiological criteria into a comprehensive scoring system. The grading system's ability to direct clinical practice and improve outcomes for patients having laparoscopic cholecystectomy can be further enhanced by ongoing validation and optimization.

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