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Predicting Conversion from Laparoscopic to Open Cholecystectomy Using a Perioperative Gallbladder Scoring System

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ABSTRACT

Background: Gallstones and associated consequences are a leading cause of elective and emergency laparoscopic and open surgical procedures. Since the first laparoscopic Cholecystectomy in 1985, laparoscopic Cholecystectomy has been the gold standard for treating symptomatic gallstones.

Several pre-operative scoring systems can tell you if a laparoscopic cholecystectomy for gall bladder surgery will be difficult based on different anatomical, imaging, and laboratory findings. However, few intraoperative scoring systems can tell if the surgery will be complicated. Some authors recently considered the most prominent essentials confronting surgeons during laparoscopic Cholecystectomy.

Aim of the study: This study attempted a planned assessment of a recently reported intra-operative gallbladder scoring framework (G10) to decide if it might predict the result of surgery, essentially the ability to complete the operation laparoscopically.

Patient and methods: Eight hundred thirty-seven patients admitted to laparoscopic Cholecystectomy for symptomatic gall stones were enrolled in this prospective study from 1st January 2018 to 31st 2021, performed in Rizgary and Hawler Teaching hospitals in Erbil, Iraq.

Results: Among 837 patients, the mean age was 42.3 (range 14–71), 581 (69.4%) were female, and 256 (30.6%) were male. The mean operation time was 32.7 minutes, ranging from 15 to 150 minutes, and 63 (7.6%) patients were converted to open Cholecystectomy because of intraoperative difficulties. The most significant correlations were found with distended and/or contracted gall bladders, the inability to grasp the wall with traumatic forceps, an impacted stone in the Hartman's pouch, and pus or bile outside the gall bladder.

Conclusion: New intraoperative scoring systems are valuable in predicting difficulties and preventing increased operation time and possible injuries; the main points of difficulties are distended or contracted gallbladder, large stone impaction, difficulty grasping the wall of the gall bladder, and the presence of bile or pus outside the gall bladder.

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INTRODUCTION

Gallstones and associated consequences are a leading cause of elective and emergency laparoscopic and open surgical procedures. Since the first Laparoscopic Cholecystectomy (LC) in 1985, laparoscopic Cholecystectomy has been the gold standard for treating symptomatic gallstones. [1–5]. Transformation to open Cholecystectomy is itself not, as it were ever so often, a need but a more secure choice than continuing laparoscopically. Surgeons, with far more prominent exposure to the laparoscopic method, may take different damage control strategies instead of transformation to open, counting different shapes of bailout strategies [6].

Hence, it is critical to standardize documentation and communication with risk-adjusted measures to permit subjective ponders and result in comparisons. Precise and reproducible stratification of the severity of the gallbladder (GB) disease requires a scoring/ grading framework that's effectively executed, clinically and operatively significant, and straightforward. Several publications have detailed modern scoring and grading frameworks [7–10].

Since Carl Langenbuch reported the first open Cholecystectomy in 1882 and Muhe the first laparoscopic cholecystectomy in 1985, strangely, there has been rising consideration for grading the severity of cholecystitis [7, 11]. LC may be both a relatively safe and persuasive process. Intraperitoneal access, establishing pneumoperitoneum, reducing adhesions, and determining the correct anatomy are just a few of the potential stumbling blocks that surgeons may face during the operation. The first and most crucial phase in LC is anatomical identification, which is best accomplished through a reflected picture design centered on a critical perspective of patient safety. Adhesion–related injuries, port site problems, and injuries to the biliary and vascular systems are only some of the many documented during the surgery. [3,4]. Because the degree of difficulty in doing LC depends not only on patient-specific factors but also on the surgeon's level of engagement and expertise, a clear definition of "difficult LC" has not yet been established, and doing so may be extraordinarily challenging. Inflammation, adhesions, and obesity are often cited as causes of these difficulties. Previous abdominal surgery or inflammatory attacks on the gall bladder may have caused the adhesions [12].

While many pre-operative scoring frameworks have been developed to forecast challenging procedures based on anatomical, imaging, and laboratory results, intraoperative scoring systems remain uncommon.in recent years, several authors have examined the full scope of the problems that surgeons face when performing LC. A modern scoring system was set recently in 2015, which is the gallbladder scoring system(G10) for cholecystitis severity score focuses on four key components: the gallbladder's operative appearance, whether distended or contracted, ease of access, and the presence of sepsis in the peritoneal cavity, either biliary peritonitis or purulent fluid, and/or a cholecysto-enteric fistula.[2] pointing to classify patients agreeing to numerous intraoperative findings with the last result whether or not to change over the operation to open Cholecystectomy or proceed with the laparoscopic approach [1]. As surgeons practicing elective and emergency surgery, we know that the operative findings and trouble are critical to the results [4].

This study planned to test a new intra-operative gallbladder scoring framework (G10) to see if it could predict the outcome of surgery or, more specifically, the surgeon's ability to do the procedure laparoscopically.

Patient and Methods:

Eight hundred thirty-seven patients who were admitted to laparoscopic Cholecystectomy for symptomatic gall stones were selected for this planned study from the period 1st January 2018 to 31st December 2021, which was performed in the Department of Surgery in Rizgary and Erbil Teaching Hospitals - Erbil city-Iraq. It was affirmed by the ethical committee (code: 8, 16, 1\10\2017) in the College of Medicine-Hawler Medical University. The operations were done by qualified general surgeons experienced in laparoscopic surgery. All patients with symptomatic gallstones were included, while those patients with obstructive jaundice, malignancy, conversion due to bleeding, and those who denied being enlisted in this study were excluded. An informed written consent was obtained from each patient for the operation and their enrollment in this research. For patients less than 18 years old, we took consent from the guardians; pre-operative assessments inform of history taking, examination, and complete investigations for the diagnosis and preparation for the operation. Intraoperative discoveries were at that point collected, and patients were utilizing the intraoperative scoring for cholecystitis seriousness categorized, which is recommended according to the nature of surgery, either elective or emergency surgery, and partitioned into a 10-point intra-operative gallbladder scoring framework (G10) and recorded within the (Table1). [2] The G10 cholecystitis severity score focuses on four key components: the gallbladder's operative appearance, whether distended or contracted, adhesions, ease of access and the presence of sepsis within the peritoneal cavity, either biliary peritonitis or purulent fluid, and/or a cholecysto-enteric fistula.[2] Patients at that point were categorized into two groups based on whether they were converted to open Cholecystectomy or not, and a comparison was performed concerning the intraoperative scoring framework of difficulties. Further data was recorded relating to the event of intra-operative complications. The operative time was recorded. The relationship of the surgical volume to open conversion was investigated.

Gallbladder surgery was considered simple if the G10 score was < 2, moderate (2 ≦ 4), complex (5 ≦ 7), and extreme (8 ≦ 10).

Appearance, adhesions from a past surgery, impacted stone bile or pus outside GB, distended shriveled GB, and failure to grasp without decompression and fistula were considered clinically relevant.

Statistical analysis: Categorical variables were depicted in frequencies and percentages, whereas continuous variables were depicted in implied and standard deviations. The P values of less than 0.05 were considered significant. The information was analyzed utilizing a statistical package for Social Sciences SPSS version 26. We used the Chi-square test for qualitative data and analyzed patient data using Microsoft Excel.

Table 1 Cholecystitis severity score used for G10 [2]

Cholecystitis severity Appearance	Score
Adhesions < 50% of GB	1
Adhesions> 50%, but GB buried	2
Completely buried GB	Three max
Distension/contraction	
Distended GB or contracted shrilled GB	1
Inability to grasp without decompression	1
Stone > 1 cm impacted in Hartmann's pouch	1
Access	
BMI > 30	1
Adhesions from previous surgery limit surgery	1
Sepsis and complications	
Free bile or pus outside the gallbladder	1
Fistula	1
Total possible	10

RESULTS

Among 837 patients, the mean age was 42.3 (range 14– 71), 581 (69.4%) were female, and 256 (30.6%) were male. Surgery was elective in 653 (78%). Our patients were mostly symptomatic middle-aged females without a history of gallstone hospitalization. Most of them had several gallstones; the mean operation time was 32.7 minutes, ranging from 15 to 150 minutes, and 63 (7.5%) were converted to open Cholecystectomy due to intraoperative complications—table 2 lists other items of interest. Agreeing with the intraoperative score categorization, 392(46.8%) of our patients were categorized as mild scores, and only 13 (1.6%) had an extreme score for difficulty, which appears in Table 3.

Table 2: the general characteristics of the patients involved in this study.

Main Category	Subcategories	Frequency	Percentage
Gender	Female	581	69.4
	Male	356	30.6
History of the previous hospitalization	No admission	428	51.1
	Biliary colic	175	20.9
	Acute cholecystitis	234	28
Comorbidities: diabetes mellitus, hypertension, ischemic heart diseases.	Nil	668	79.8
	Presence	169	20.2
History of jaundice	Nil	759	90.7
	Presence	78	9.3
Number of stones	Single	169	20.2
	Multiple	668	79.8
Conversion to open	Not converted	774	92.5
	converted	63	7.5

Table 3: Perioperative Scores and Categories of the involved patients.

Perioperative Scores/Categories	Frequency	Per cent
Less than 2 (Mild)	392	46.8
2-4 (Moderate)	320	38.2
5-7 (very difficult)	112	13.4
8-10 (Extreme)	13	1.6

The rates of each category of both bunches are outlined.

The foremost significant relationships were found with enlarged and/or contracted gall bladder, failure to get a handle on the wall with atraumatic forceps, an impacted stone within the Hartman's pocket, and pus or bile exterior of the gall bladder. No relationship was identified with other discoveries. The correlations were calculated utilizing Fisher's exact test—table 4.

Table 4: Comparison between patients who converted to open Cholecystectomy and those who did not adopt the intraoperative new scoring system for cholecystitis severity.

Perioperative findings	Conversion to open		P-value
	No=774(92.5%)	Yes=63(7.5%)	
Gall bladder Appearance			
No adhesions	432(55.8%)	12(19.1%)	
Adhesions < 50% of GB	221(28.6%)	23(36.5%)	0.122
Adhesions> 50%, but GB buried	121(15.6%)	28(44.4%)	

Distended or contracted shrilled GB was found in 164 patients, and 44 (69.8%) patients were converted to open, which is statistically significant (p-value =0.000), 134 cases were among those with the inability to grasp without decompression, of which 47 (74.6%) patients were converted to open (p-value =0.001). Stone> 1 cm impacted in Hartmann's pouch was found in 162 cases in which 36 (57.1%) patients were converted to open with (p-value =0.004), 181 patients had BMI > 30, in which 18(28.6%) patients were converted to open with (p-value =0.122), Adhesions from previous surgery limiting surgery access were seen in 85 cases, and 12(19%) patients were converted to open with (p-value =0.123. Free bile or pus outside the gallbladder was seen in 67 cases, and 16(25.4%) patients were converted to open with (p-value =0.017). In 14(22.2%) patients, the time needed to identify cystic artery and duct was>90 minutes, which led to an open conversion with (p-value =0.084). Each severity category was compared in both groups; the correlation was very significant between the two groups of patients (table 5).

Table 5: Comparison of Perioperative scores/Categories between Patients who converted to open and those not to Open Cholecystectomy, adopting the intra-operative new scoring system for cholecystitis severity

Perioperative scores/Categories	**Conversion to open**		**Total**	**P-value**
	No=774(92.5%)	**Yes=63**	837	
Less than 2 (Mild)	386(49.9%)	6(9.5%)	392	0.002
2-4 (Moderate)	309(39.9%)	8(12.7%)	317	
5-7 (very difficult)	79(10.2%)	36(57.14%)	115	
8-10 (Extreme)	0(0%)	13(20.6%)	13	

DISCUSSION

The optimistic result in Cholecystectomy may be through a laparoscopic approach, but with a marginally rising chance of biliary tree damage, and the most recent consensus in Tokyo emphasizes that change to open surgery is not a complication and, in truth, may be more secure than seeking after the laparoscopic surgical approach in-person cases [6]. The bailout is a vital choice for experienced surgeons for a complex open case. Conversion to an open approach is not continuous wrongdoing [13].

Difficult LC could be a genuine challenge that confronts surgeons during an operation. Numerous times, it is unusual before surgery and found only intraoperatively. Acknowledging: Acknowledging the biliary tree anatomy and the standards of laparoscopic surgery optimizes the performance during laparoscopic Cholecystectomy; appropriate patient positioning and exact port arrangement are the other variables. Although LC is one of the foremost broadly practiced surgical strategies, it is still related to a few morbidities and mortalities [2,4,12].

The rate conversion of open Cholecystectomy extends from 1 to 13% in most of the articles in our patients; the change rate was 7.5%, typically regarded as a satisfactory rate compared to the literature [4, 7, 14].

Both acute and chronic cholecystitis are associated with increased wall thickness, and the shrunken gall bladder seen in chronic cholecystitis is widely recognized as a source of intraoperative challenges. The failure to grasp with certain traumatic forceps and a swollen and /or contracted gall bladder was significantly related to a lower conversion rate in this study (P values 0.000 and 0.001, respectively). Separately, our results stand with previous studies that declared that thickened gallbladder walls are related to higher conversion rates to open procedures because of technical challenges [4, 7, 12, 15, 16]. Most of our patients were young, middle-aged females with no history of hospitalization due to gallbladder stones symptoms. Male sex was one of the difficulty points in a few literatures [4, 7]; contrary to our study, no significant correlation was found.

The authors examined a wide range of potential obstacles; despite widespread agreement that a body mass index(BMI)of 30 or above represents a significant hurdle, we found no statistically significant correlation between BMI and conversion rate (P value 0.122). Despite our observation, some researchers have linked a BMI of 30 or higher to a higher rate of change [3,4,7,17,18]. Large gall bladder stones and over 80% of patients with several stones presented as obstacles. An

operation's time and the likelihood of a critical view of safety obscuring when a huge stone is impacted in Hartmann's pouch. One of the most challenging aspects of our study was the presence of a single stone ≥1 cm impacted in Hartmann's pouch; however, this aspect can be managed by genteelly pushing the Stone upward toward the fundus of the gall bladder, applying the grasping forceps under the Stone and then grasping the gall bladder toward the right shoulder. This result and this stone-pushing maneuver are similar to other studies [4,7,17,19].

Thick adhesions, particularly in patients with previous upper abdominal operations, restrain the critical view of safety and make the dissection difficult. Another challenge in patients with previous umbilical hernia surgery is that it makes umbilical port access difficult because of adhesions and changing closed (veress needle) approach to open method and or Palmer's point to prevent intra-abdominal injuries. In this study, adhesions because of upper abdominal surgery essentially make the conversion rate not significant (P-value 0.123), as few studies declared that it might increase the operation time with no higher rates of transformation [4, 7, 15, 19-21].

In our study, the relationship between the gall bladder adhesions and gallstone was unnecessary (P-value 0.122). Most patients (53.04%) had no adhesions with the gall bladder, 17.8% had adhesions that buried their gall bladder, and (44.4%) had adhesions in the Calots triangle. These results are similar to other studies; other adhesions are between the gall bladder and the omentum [4,7,17,22–24]. One of the fundamentals of surgery is the length of time it takes to operate; however, this time can vary greatly depending on factors such as the surgeon's level of surgeon's experience, the presence of acute inflammation, stone impaction at the Hartman's pouch, and the presence of the biliary tree anomalies. Our study found that the average duration of surgery was about 32.7 min, and there was no statistically significant correlation between the amount of time it took to identify the cystic artery and the duct and the rate of transformation. While many published works describe similar surgical times, this variable can be reduced when landmarks like the artery and the cystic duct are easy to spot [3,4, 25]. The presence of pus or bile around the gall bladder during surgery is associated with a higher risk of complications and a higher rate of change in our study (P-value 0.017). This collection may be recognized preoperatively using diverse imaging methods [4, 7, 17].

CONCLUSION

New intraoperative scoring systems are valuable in predicting difficulties and preventing increased operation time and possible injuries; the main points of difficulties are distended or contracted gallbladder, large stone impaction, difficulty grasping the wall of the gall bladder, and the presence of bile or pus outside the gall bladder.

Conflict of interest:

This study has no conflict of interest to be declared by the author.

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