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Correlation of G-10 Scoring & Per Operative Outcomes in Laparoscopic Cholecystectomy: A Tertiary Care Centre Experience

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Abstract:- Laparoscopic cholecystectomy is one of the most commonly performed surgeries worldwide and has only recently achieved a perioperative predictive score. This study aims to document our experience as a tertiary care hospital regarding the use of the same. 250 patients were considered in a prospective observational study, subsequently recording the intraoperative findings and postoperative complications based on G10 scoring put forward by the WSES based on the Sugrue study. They were classified as easy, moderate, difficult, and extremely difficult.

The mean operative time was 48.58 min (range 30 to 190). The conversion rate was 2%. A p value of <0.0001 shows G10 scoring is significantly related to open conversion. Overall, 19 (7.60%) patients were found to have a difficult or extreme degree of operative difficulty as judged by a G10 score of 5 or greater. A significant relationship was found with respect to bile duct injury, biliary fistula, vessel injury, abscess formation, and readmission in view of G10-based scoring difficulty.

Validation and widespread adaptation may provide a standard for understanding and improving care and enable more standardization in global comparisons of care for cholecystectomy. This study is a single institution experience validating the significance of intraoperative scoring for biliary disease management.

Keywords:- *G10 Score, Intraoperative Difficulty, Post-Cholecystectomy Complications, Surgical Outcomes.*

I. INTRODUCTION

Laparoscopic cholecystectomy is one of the most common operations in both elective and emergency surgery and is the management of choice for biliary disease and cholecystitis.[1] Outcomes from cholecystectomy vary, particularly in terms of operative approaches and findings, use of intraoperative cholangiography, conversion from laparoscopic to open, length of surgery, and morbidity, including readmission to hospital.[2] Although the procedure has numerous advantages over the open counterpart (eg. Less pain, less hospital stay, early return to family and occupation, better cosmesis) it may be difficult to perform in a varied severity or even converted to open procedure owing to the anatomical and surgical factors encountered intraoperatively, and these operative factors hold the key to outcome.[3-7] Numerous publications have been published regarding difficulty in laparoscopic surgery, but majority of them emphasized on the preoperative status and the imaging findings while a very few focused on the intraoperative anatomical and surgical parameters which is as important as the preoperative part.

A 10 point Gall Bladder scoring system (G10) established by the WSES(World Society Of Emergency Surgery) which developed by Sugrue et al. is an intraoperative grading system.[2] This study undertakes a prospective evaluation of a recently reported intraoperative G10 gallbladder scoring system to determine whether it could predict the outcome of surgery, primarily the ability to complete the operation laparoscopically in a tertiary care hospital setup, and our experience regarding the same.

II. MATERIALS AND METHODS

An observational prospective study was conducted after due approval of the Ethics Committee, Sola Civil Hospital, comprising patients undergoing laparoscopic cholecystectomy from January 2024 to March 2024 and followed up until July 2024. The G10 cholecystitis severity score from the WSES was recorded and categorised accordingly. All laparoscopic cholecystectomies were done as elective procedures. Further information was recorded regarding the occurrence of intraoperative complications and previous intervention of the common bile duct (CBD). Whether the procedure was completed laparoscopically or converted to open was documented. The operative time was recorded. Gallbladder surgery was considered easy if the

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G10 score < 2, moderate (2-4), difficult (5-7) and extremely difficult (8-10).

Descriptive data was presented as the mean, standard deviation, and range. A p value < 0.05 represented statistical significance. Univariate analysis was performed to identify risk factors associated with conversion to open cholecystectomy. Variables with a p value < 0.05, i.e. GB appearance, adhesions from previous surgery, impacted stone, bile, or pus outside the GB, distended or shriveled GB, inability to grasp without decompression , and fistula were considered clinically relevant.

Table 1 Statistical Significance

Appearance	**Adhesions <50% of GB**	**1**
	Adhesions >50% of GB	2
	Buried GB	3
Distension/Contraction	Distension/Contracted shrilled GB	1
	Inability to grasp without decompression	1
	Stone >1cm impacted in Hartmanâ€™s pouch	1
Access	BMI >30	1
	Adhesions from previous surgeries	1
Sepsis and complications	Free bile/pus outside GB	1
	Cholecystoenteric fistula	1

Total score: 10
Patient score:
Grades:
<2: Easy
2-4: Moderate
5-7: Difficult
8-10: Extremely difficult

III. RESULTS

A total of 250 patients, mean age 47.504 (range 20 years to 78 years) were considered out of which 234/250 (93.6%) were female. All laparoscopic cholecystectomies were performed as elective surgeries. The mean operative time was 48.58 min (range 30 to 190). The conversion rate was 2%. A p value of <0.0001 shows G10 scoring is significantly related to open conversion. Overall, 19 (7.60%) patients were found to have a difficult or extreme degree of operative difficulty as judged by a G10 score of 5 or greater.

The relationship between difficulty grading according to the G10 score and complications is shown in Table 1 along with their respective p-values.

Table 2 Difficulty level vs Complcations along with their Significance as Measured by Chi Square Tests

Open conversion V/s difficulty						
	Easy	Moderate	Difficult	Extremely difficult	Grand Total	Chisquare (Pvalue)
Yes	0	0	3	2	5	123.95 (<0.00001)
No	130	101	14	0	245	
Grand Total	130	101	17	2	250	
Bile duct injury						
	Easy	Moderate	Difficult	Extremely difficult	Grand Total	Chisquare (Pvalue)
No	130	101	16	1	248	68.4 (<0.00001)
Yes	0	0	1	1	2	
Grand Total	130	101	17	2	250	
Biliary fistula						
	Easy	Moderate	Difficult	Extremely difficult	Grand Total	Chisquare (Pvalue)
No	130	101	17	1	249	124.498 (<0.00001)
Yes	0	0	0	1	1	
Grand Total	130	101	17	2	250	
Vessel injury						
	Easy	Moderate	Difficult	Extremely difficult	Grand Total	Chisquare (Pvalue)
No	130	101	14	1	246	61.319 (<0.00001)
Yes	0	0	3	1	4	
Grand Total	130	101	17	2	250	
Gut injury						
	Easy	Moderate	Difficult	Extremely difficult	Grand Total	Chisquare (Pvalue)
No	130	101	17	2	248	6.644 (0.084)
Yes	0	1	1	0	2	
Grand Total	130	101	17	2	250	
Abscess formation						
	Easy	Moderate	Difficult	Extremely difficult	Grand Total	Chisquare (Pvalue)
No	130	101	16	1	248	68.4 (<0.00001)
Yes	0	0	1	1	2	
Grand Total	130	101	17	2	250	
Readmission						
	Easy	Moderate	Difficult	Extremely difficult	Grand Total	Chisquare (Pvalue)
No	130	101	13	1	245	68.427 (<0.00001)
Yes	0	0	4	1	5	
Grand Total	130	101	17	2	250	

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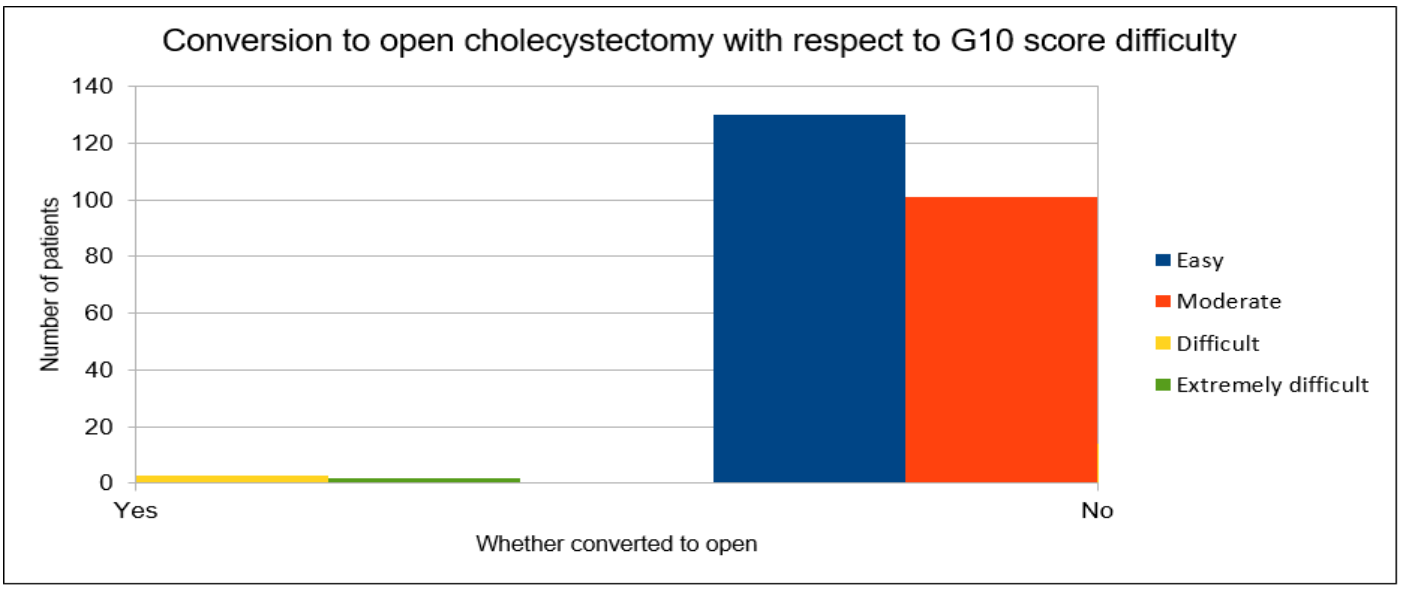

Fig 1 Graph Comparing G10 Difficulty to Open Conversion

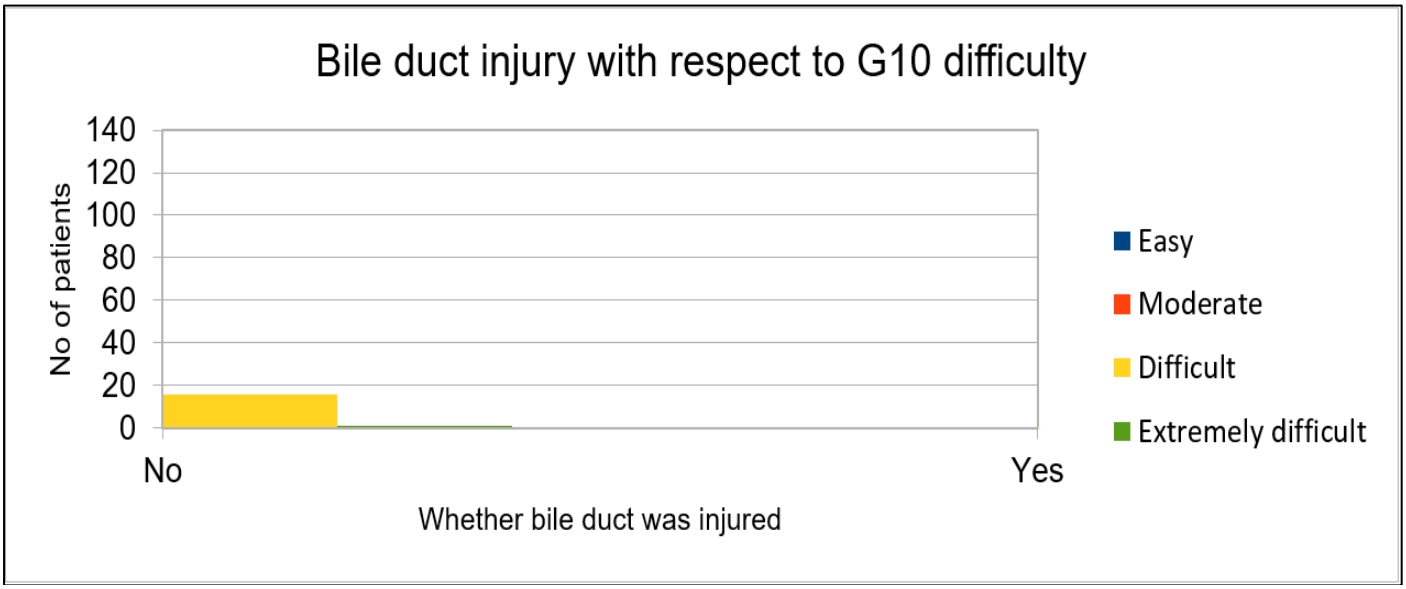

Fig 2 Graph Comparing G10 Difficulty to Whether there was Formation of Biliary Fistula

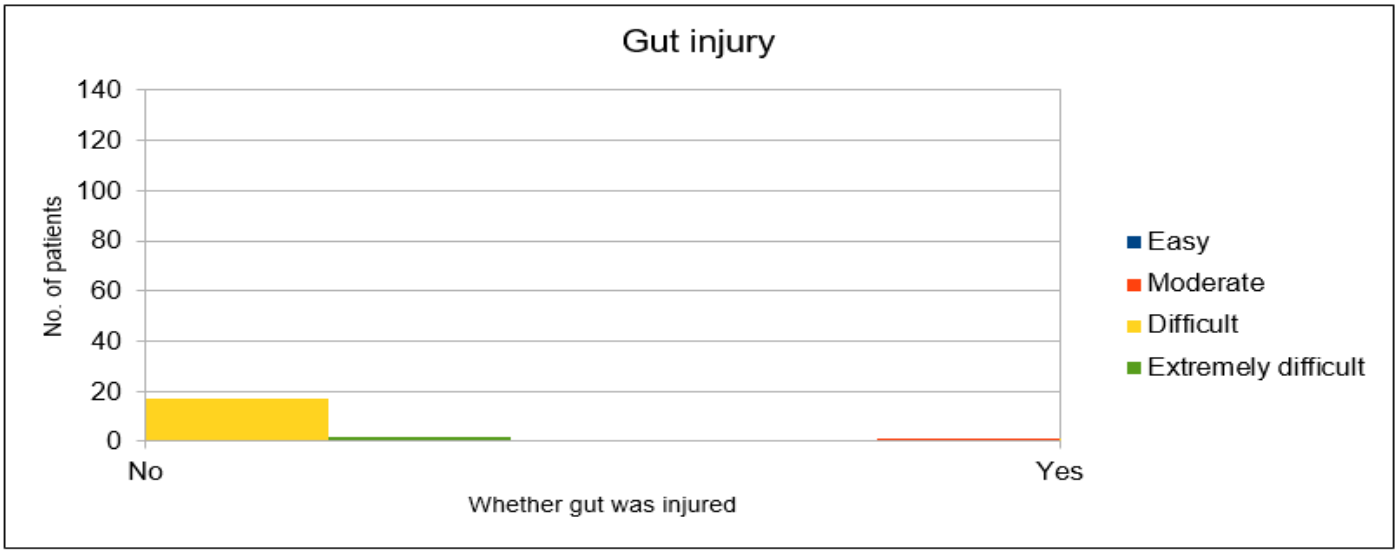

Fig 3 Graph Comparing G10 Difficulty to Whether gut was Injured

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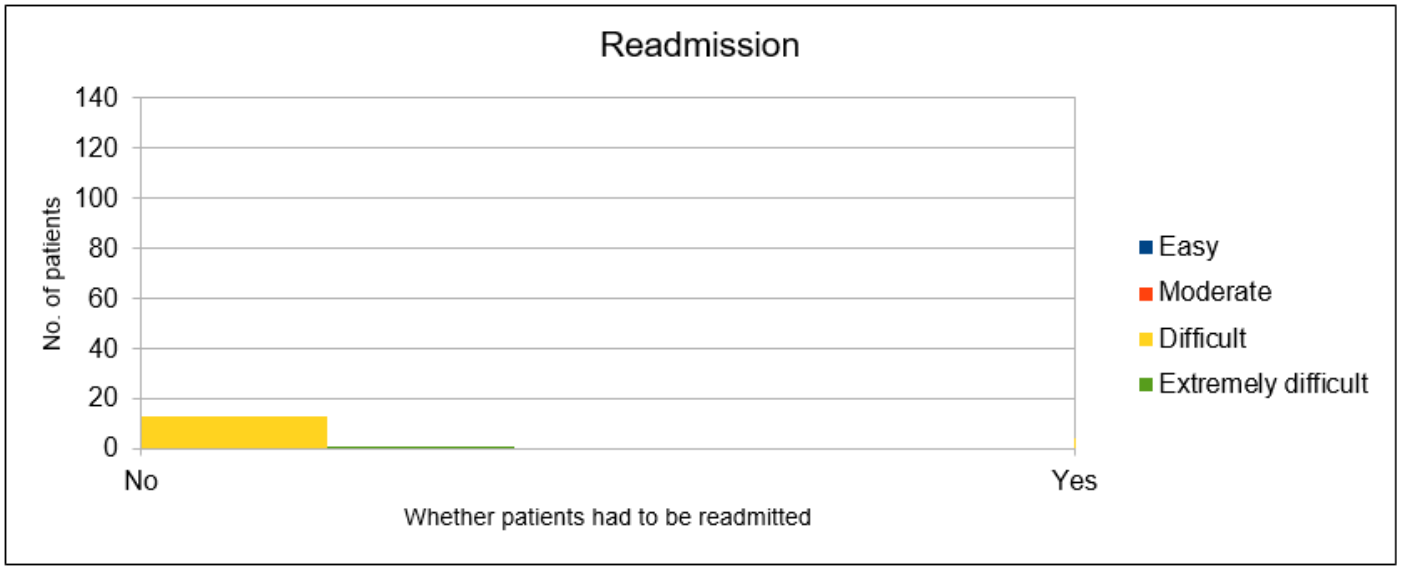

Fig 4 Graph Comparing G10 Difficulty to Whether rate of Readmission

IV. DISCUSSION

Since Carl Langenbuch reported the first open cholecystectomy in 1882 and Muhe the first laparoscopic cholecystectomy in 1985 surprisingly it is only recently there has been increasing attention to grading severity of cholecystitis. In the 1980s and 1990s, Hanna et al. and Nassar et al. described simple scales of difficulty for cholecystectomy. Recently, Wakabayashi et al., as part of the Tokyo 2018 guidelines, suggested 25 operative findings with scores that may affect the technical difficulty of cholecystectomy

Intricate understanding of the underlying disease can pave the way for optimal care and care pathways.[8,9] As surgeons, we know that there are unique variable technical difficulties encountered during cholecystectomy, and these fundamentally are related to the access, adhesion, density, vascularity, thickness, friability, weight, and thickness of the gallbladder.[2] As surgeons may not possess the experience required for a complex open case, bailout as well as conversion might be the only logical solution.[10] Studies typically focus on predicting conversion risks before surgery. While this helps surgeons warn patients and plan accordingly, it shouldn't automatically mean skipping laparoscopy altogether, especially if the patient has a specific set of risk factors.

Kumar N et al (2017) found that the severity score was between 2-4 in 63 (61.16%) patients and between 5-7 in 20 (19.41%) patients. Mild to moderate degree of difficulty was encountered in 80 (77.66%), severe degree in 20 (19.41%) and extreme degree of difficulty in 03 (2.91%) patients in performing cholecystectomy. Conversion to open surgery were done in 08 (7.76%) patients with score between 6 to 8.[11]

Sugrue M et al (2019) found that surgery was performed by consultants in 70% and was elective in (56%) with a mean operative time of 78.7 min (range 15-400). The mean G10 score was 3.21, with 22% deemed to have difficult or extreme surgical gallbladders, and 71/504 patients were converted. The G10 score was 2.98 in those completed laparoscopically and 4.65 in the 71/504 (14%) converted. ($p < 0.0001$; AUC 0.772 (CI 0.719–0.825). The optimal cut-off point of 0.067 (score of 3) was identified in G10 vs conversion to open cholecystectomy. Conversion occurred in 33% of patients with G10 scores of ≥ 5. The four variables statistically predictive of conversion were GB appearance—completely buried GB, impacted stone, bile or pus outside GB and fistula.[1]

The Parkland grading system for cholecystitis provides a standardized way for surgeons to assess gallbladder inflammation during surgery. This allows researchers to group patients based on severity and investigate how anatomical changes and inflammation impact surgical difficulty, complication rates, and other outcomes. A total of five grades were formulated, hypothesizing that changes in gallbladder anatomy and inflammation would relate to the perioperative outcomes.[12] Also, this grade has recently been validated by the proposer authors in 317 gallbladders with statistically significant factors, such as acute cholecystitis, surgical difficulty, the incidence of a partial and open cholecystectomy, preoperative WBC, length of surgery and bile leak rates, which showed increment with increasing grades. However, further validation studies are needed to facilitate the significance of this study.[13]

The updated Tokyo Guidelines (TG18) categorize cholecystitis into mild, moderate, and severe (grades 1, 2, and 3 respectively). Treatment is based on this grading. For mild cases (grade 1), TG18 recommends early laparoscopic surgery (LC) for suitable patients (healthy with low surgical risk).[12]

For moderate cases (grade 2), TG18 again recommends early LC by experienced surgeons for suitable patients. If not suitable, treatment with medication and/or draining the gallbladder might be done first, followed by LC later.

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Severe cases (grade 3) have even stricter criteria, requiring good organ function, specific patient characteristics (healthy with low surgical risk), and being treated at a specialized center. If not meeting these criteria, TG18 suggests early drainage of the bile ducts followed by LC once the patient's condition improves.

It's important to note that TG18 focuses on pre-operative factors and doesn't consider what happens during surgery itself. Similarly, the latest Tokyo consensus highlights that switching from laparoscopic to open surgery (conversion) shouldn't be seen as a mistake, but rather a safety measure for the patient.

In our study, out of 250 patients, 130 patients had severity score of 0-1 (easy), 101 had severity score of 2-4 (moderate), 17 with a score of 5-7 (difficult) and 2 with a score of more than 7 (very difficult). Open conversion was done in a total of 5 patients, in the difficult and extremely difficult category. The conversion rate was 2% overall and 29.41% in patients with G10 score >5. A significant relationship was found with respect to bile duct injury, biliary fistula, vessel injury, abscess formation, and readmission in view of G10-based scoring difficulty. The most difficult cases, we noticed, to deal with laparoscopically, were those with free bile/pus and cholecystoenteric fistula along with severe adhesions reducing visibility and access to gallbladder significantly.

Surgeons operating on complex gallbladders often rely on special imaging techniques like intraoperative cholangiography (IOC) to see the bile ducts clearly. This helps them avoid accidentally injuring these ducts during surgery.[15] However, these imaging techniques are not available in many Indian hospitals. This lack of imaging makes it even harder to perform surgery on difficult gallbladders, requiring surgeons to be very skilled at dissecting the area and have alternative plans in case of complications.

A unified intraoperative scoring system would ease further management that might not be available preoperatively and might standardize care, although it requires further studies with a larger sample size and correlation with preoperative scoring. A disadvantage of the G10 is that it is an operative scoring system, and patients who undergo interventions without surgery cannot be assessed. The surgeon's experience can also influence conversion rates. Factors like years of experience, the number of surgeries performed, experience with complex cases, and their comfort level with continuing laparoscopy during difficulties (such as bleeding or suspected bile duct injury) can all play a role.

V. CONCLUSION

The G10 operative scores provide simple grading of operative cholecystectomy and are predictive of the need to convert to open cholecystectomy. Validation and widespread adaptation may provide a standard for understanding and improving care and enable more standardization in global comparisons of care for cholecystectomy. This study is a single institution experience validating the significance of intraoperative scoring for biliary disease management; however, the adoption of an agreed intraoperative grading with or without pre operative difficulty prediction scoring is necessary to advance the road to improved outcomes for patients with biliary disease.

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