



## PREDICTION OF SURGICAL OUTCOMES OF LAPAROSCOPIC CHOLECYSTECTOMY USING INTRAOPERATIVE GRADING SCALE IN PATIENTS UNDERGOING LAPAROSCOPIC CHOLECYSTECTOMY

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**ABSTRACT** The gold standard for gall bladder disease is Laparoscopic cholecystectomy (LC). Conversion of LC to open is a significant component in terms of conducting a safe surgery, an improved knowledge of factors contributing to conversion and complications post-surgery would be useful and helpful.

In this study, a validated scoring system based on intraoperative findings during LC has been used which allows scoring of these findings and standardizes the degree and severity of gall bladder related disease, also predicting the level of difficulty in performing the surgery. G10 is a simple grading scale based on intraoperative parameters, predicts likely difficulty in performing the surgery, various surgical outcomes such as conversion to open cholecystectomy, intraoperative complications, requirement and duration of a drain, duration of hospital stay, and post-operative complications.

G10 score helps the surgeon and team to be better prepared with possible surgical outcomes, need for conversion to laparoscopic cholecystectomy and can be used as a tool in counselling the patient. G10 score of 5 was considered as the optimum point to predict conversion of LC to open. Intraoperative decision of conversion from laparoscopic to open cholecystectomy is neither a complication nor should it be considered as a failure, but rather to be considered as a decision taken to prevent possible intraoperative or postoperative complication and to ensure patient safety which can be achieved using G10 intraoperative scoring scale.

**KEYWORDS :** Laparoscopic cholecystectomy, scoring scale, gall bladder

### INTRODUCTION:

Amongst the population throughout the world, 3 to 20% of the people are diagnosed with Gall bladder stones, majority of which are asymptomatic (Josef E. Fischer, 2019). Only around 3 % of asymptomatic gallstone patients become symptomatic every year. Dyspepsia, pain in the upper abdomen, nausea, vomiting, fever, are the complaints. Adverse effects of gall stones include cholecystitis, choledocholithiasis, cholangitis, biliary pancreatitis, cholecysto choledochal fistula, cholecystoenteric or cholecyst oduodenal fistula leading to gallstone ileus and carcinoma gallbladder (Josef E. Fischer, 2019). Gall bladder pathology is diagnosed by ultrasonography, CT scans, HIDA scans. The treatment of choice for all benign gall bladder pathology.

Worldwide, amongst the performed laparoscopic cholecystectomy surgeries, 3 to 10% were reported to have needed conversion of laparoscopic cholecystectomy to open cholecystectomy. (Alponat et al., 1997; Sanabria et al., 1994; Schrenk et al., 1998) Usually, laparoscopic cholecystectomy is performed in most cases unless its contraindicated. LC has various advantages such as decreased morbidity, lesser hospital stays, better cosmesis and shorter recovery time. Though this procedure is very commonly performed, all laparoscopic cholecystectomies need not have same outcomes, as at times, conversion to open cholecystectomy is needed. (Henry Hamilton Bailey, Robert J McNeill Love, 2018; Josef E. Fischer, 2019) Conversion of laparoscopic to open cholecystectomy can be attributed to factors such as association with acute cholecystitis, presence of dense adhesions, anatomic variations or anomalies, massive fibrosis, prior surgeries of the abdomen, biliary pancreatitis, post ERCP status, technical issues, and intraoperative complications like uncontrolled haemorrhage due to injury to cystic artery or hepatic artery, injury to bile duct, injury to surrounding organs.<sup>9,13</sup> This conversion is associated with complications such as increased risk of surgical site infection, extended hospital stay, respiratory infections, delayed extubation and need for ICU care. Hence, intraoperative scoring scale, such as G10 severity score helps the surgeon and team to be more prepared, with improved efficiency and timing of decision making in terms of conversion to open cholecystectomy based on intraoperative findings. (Fried et al., 1994; Sanabria et al., 1994; Vivek et al., 2014) Also, this scoring scale helps in predicting intraoperative complications, requirement of drain in-situ, duration of drain placement, durations of hospital stay and possible post-operative complications such as haemorrhage or bile leak.

### MATERIALS AND METHODS:

#### OBJECTIVES:

To predict the conversion in patients undergoing laparoscopic

cholecystectomy to open cholecystectomy using G10 score.

To correlate the G10 score with surgical outcome in patients undergoing laparoscopic cholecystectomy (such as duration of surgery, intraoperative complications, requirement of a drain, duration of drain being kept in situ, duration of hospital stay, and post-operative complications).

A Prospective cohort study was done comprising of 312 patients diagnosed with benign gall bladder disease, who were admitted under Department of General Surgery, JSS Hospital, Mysuru, from October 2019 to September 2021, and planned for laparoscopic cholecystectomy.

During the surgery, intraoperative findings were observed and scored according to G10 grading scale and the score was calculated, based on which difficulty of surgery and need for conversion into open laparoscopic cholecystectomy was assessed. Further based on this scoring and difficulty of the surgery, other surgical outcomes such as requirement of drain, duration of drain in situ requirement and duration of hospital stay are predicted and assessed.

#### Sample size:

Estimated as 312 cases of laparoscopic cholecystectomy, considering AUC/Accuracy is 77.2% (Ref), 5% alpha error, power of 95% and 1:25 conversion rate.

#### Sampling Technique:

Universal Sampling

#### RESULTS

Results were analysed using SOC Calculator, Microsoft Excel version 2019 and SPSS Version 24.

Gallbladder surgery was considered easy if the G10 severity score < 2, moderate (2 ≅ 4), difficult (5 ≅ 7) and extreme (8 ≅ 10). (Sugrue et al., 2019) According to G10 severity score, as the score is higher, more is the severity of the disease, increasing the level of difficulty in performing the surgery.

**Table 1: G10 Severity Score**

CHARACTERISTICS	SCORE
<b>APPEARANCE:</b>	
Adhesions <50%	1
Adhesions >50%	2
Completely buried GB	3
<b>DISTENSION/ CONTRACTION</b>	

Distended or contracted GB	1
Inability to grasp without decompression	1
Stone >1cm impacted in hartman's pouch	1
ACCESS	
BMI > 30	1
Adhesions from previous surgery limiting LC	1
COMPLICATIONS	
Free bile or pus outside the GB	1
Fistula	1
TOTAL (Max)	10

**Population Demographics:**

**Table 2: Study Population Characteristics And Frequency**

STUDY POPULATION CHARACTERISTICS		FREQUENCY	PERCENTAGE
Age Group	31-50 yrs	137	43%
Gender	Male	121	61%
	Female	191	39%
Comorbidity	Diabetic	78	25%
Most common symptom	Pain in the upper abdomen	307	98.4%
Most common Histopathological diagnosis	Chronic calculous cholecystitis	131	42%

Of the study population of 312 individuals, 121 were males and the rest were females, indicative of symptomatic gall bladder pathology being more common in females. 43% of the study population were in the age group of 31 – 50 years.

**Preoperative Analysis:**

Amongst the study sample, 25% of the sample population were found to be diabetic. It was observed that diabetics presented with a more severe disease, with the chi-square of the 2x2 contingency table being 21.1356 with a **significant p-value of <0.00001**, proving that **patients with diabetes presented with a more severe form of disease, for which the surgery performed was difficult or extreme.**

Past history of previous abdominal surgeries was considered, and it was noted that 9% of the total study population had undergone previous abdominal surgeries and, analysis of association of past history of abdominal surgeries gave a chi-square value of 11.4614 with a **significant p-value of .000711**, showing that the **level of difficulty in performing laparoscopic cholecystectomy was increased in patients with history of previous surgeries to the abdomen.**

**Intraoperative Analysis**

Based on the G10 score obtained by intraoperative observation, cases were divided as severe (G10 scores of 5 or greater) and non-severe (G10 scores of less than 5).

**Table 3: Disease Severity based on G10 Score**

	Count	Percentage (%)
Severe Disease	38	12.2%
Non-Severe Disease	274	87.8%

Based on the G10 score obtained, cases were classified as: **Easy** (<2), **Moderate** (2 ≤ 4), **Severe** (5 ≤ 7) and **Extreme** (8 ≤ 10).

**Table 4: Case Distribution per G10 Score**

G10 Score	Count	Percentage (%)
Easy	0	0
Moderate	274	87.8
Severe	35	11.2
Extreme	3	1

Conversion from laparoscopic surgery to open surgery was made as an intraoperative decision based on various intraoperative difficulties.

**Table 5: Conversion Rate to Open Surgery**

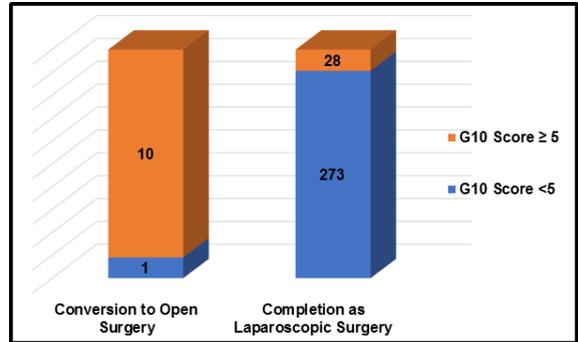
	Count	Percentage (%)
Conversion to Open Surgery	11	3.5
Completion as Laparoscopic Surgery	301	96.5

Based on G10 scores, conversion rate and severity association were assessed.

**Table 6: Association of Conversion Rate and Disease Severity**

	G10 Score <5	Percentage (%)	G10 Score ≥ 5	Percentage (%)
Conversion to Open Surgery	1	0.3	10	3.2
Completion as Laparoscopic Surgery	273	87.5	28	9.0

The chi-square value with respect to conversion rates was 66.0742 with a **significant p-value of <0.00001**, showing that there was a **positive association between higher G10 scores and conversion to open surgery.**



**Figure 1: Association Of Conversion Rate And G10 Score**

Duration of surgery was calculated in minutes from the time of incision for insertion of first port to the time of removal of last port and closure after specimen extraction in laparoscopic surgeries or till complete closure of skin incision and port sites in converted surgeries. The **mean duration of surgery was 76.14 minutes** (with surgical procedures ranging from 30 minutes to 5 hours).

Test of significance between the Severity of the disease as assessed by the G10 severity score and duration of surgery gave a **t-value of -18.49111** with a **significant p-value of <0.00001**, showing that **severe cases were typically associated with longer durations of surgery.**

Surgical drains were kept in 212 of the cases, typically draining the gall bladder fossa in the under surface of the liver.

Multiple intraoperative complications were encountered in 44 cases; with complications being almost 1.5 times more in severe cases of the disease than non-severe cases. Out of 312 patients, 27 patients with severe disease (8.7%) had intraoperative complications, compared to 17 patients with non severe disease (5.4%). The most common intraoperative complication encountered was injury to the dense adhesions (40.9% of all complications) followed by injury to liver surface (27.20%).

It was noted that complications were more common in severe cases than in the non-severe cases.

**Post-operative Analysis**

Of the 212 cases in which drains were placed, the **drain was kept in-situ for an average of 1.89 days (range of 1 to 14 days)**. The duration for which the drain was retained in-situ was assessed against the noted intraoperative severity of the cases based on G10 severity score. It was noted that the association had a **significant p-value of <0.0001**, showing that **drain removal was delayed in severe disease** requiring longer retention of the drain in-situ as compared to non-severe disease. The mean duration of hospital stay in the study population was 6.13 days (ranging from 3 days to 19 days). Test of significance between the Severity of the disease as assessed by the G10 severity score and duration of hospital stay gave a **t-value of -10.85665** with a **significant p-value of <0.00001**, showing that **severe cases were typically associated with longer durations of hospital stay** for recovery before discharge.

A total of **10 patients (3.2%)** were noted to have developed **post-operative complications**. The 2 major post-operative complications encountered were **haemorrhage** from the liver bed and **bile leak**. It was noted that post-operative complications were observed in patients with severe disease only.

## CONCLUSION

One of the most performed surgical procedure of the biliary tract and the gold standard choice for the management of pathology of the gall bladder. In our study, with the use of a validated intraoperative G10 scoring scale, the decision for conversion to open cholecystectomy was better assessed, allowing the surgeon and team to be better prepared, with higher efficiency and timing of decision making. In this study, the conversion of laparoscopic to open cholecystectomy was seen in 3.5% of the patients who underwent laparoscopic cholecystectomy based on the G10 score. This scoring helps in predicting intraoperative complications, requirement of drain insitu, duration of drain placement, duration of hospital stay and possible post-operative complications such as haemorrhage or bile leak, which helps the surgeon to counsel the patient and kin post operatively, regarding the further course hospital stay, any anticipated probable complications, and their management if needed.

Hence, through this study we would like to conclude, that the intraoperative decision of conversion from laparoscopic to open cholecystectomy is neither a complication nor should it be considered as a failure, but rather to be considered as a decision taken to prevent possible intraoperative or postoperative complications as well as to ensure patient safety which can be achieved using the validated G10 intraoperative scoring scale.

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