Intraoperative Gallbladder Scoring Predicts Difficulty of Surgery and Conversion of Laparoscopic to Open Cholecystectomy

Waleed Umer, Rifaat Qamar Naqvi, Fahad Shakil, Mansoor Tariq*

Department of General Surgery, Combined Military Hospital/National University of Medical Sciences (NUMS) Rawalpindi Pakistan,
*Department of General Surgery, Pak Emirates Military Hospital/National University of Medical Sciences (NUMS) Rawalpindi Pakistan

ABSTRACT

Objective: To determine the ability of "Gallbladder Operating Score (G10)" to predict difficulty of surgery and timely conversion of laparoscopic to open cholecystectomy.

Study Design: Cross sectional study.

Place and Duration of Study: General Surgery Unit of Combined Military Hospital, Rawalpindi Pakistan, from Nov 2021 to Nov 2022.

Methodology: One hundred and eleven cases scheduled to undergo laparoscopic cholecystectomy were recruited. After an informed consent age, gender, Body Mass Index, G10 score and category of severity ranging from mild to extreme was documented. Operative time was documented to define difficult cholecystectomy alongside conversion of laparoscopic to open cholecystectomy.

Results: A total of 111[53(47.70%) male and 58(52.30% female)] cases who were scheduled to undergo laparoscopic cholecystectomy were included with mean age of 43.36±5.33 years. Median G10 score of patients was 3.00 (range: 1.00-8.00). Overall frequency of conversion from laparoscopic to open cholecystectomy was 9(8.10%). G10 between the study participants who experienced conversion of laparoscopic to open cholecystectomy as compared to those who had their laparoscopic cholecystectomy completed was statistically significant (*p*=0.003).

Conclusion: Gallbladder Operating Score (G10) is helpful in predicting the difficulty cholecystectomy and conversion of laparoscopic to open cholecystectomy.

Keywords: Cholecystectomy, Cholelithiasis, Laparoscopic cholecystectomy.

INTRODUCTION

When performing surgery on the biliary system, it is essential to have a comprehensive understanding of anatomical variations in gallbladders among individuals[1]. Development of gallstones is linked to broad number of risk factors including being over the age of forty, obesity, pregnancy, being a female, having thyroid dysfunction, and having high cholesterol.[2,3] Clinically, pain in right upper abdominal quadrant with or without jaundice, are amongst the major presenting complaints of these patients [4].

Gallstones and their associated complications are common indications for surgical intervention[5]. Laparoscopic cholecystectomy is now the standard surgical approach for gallbladder intervention[6]. In most cases, laparoscopic cholecystectomy is a successful treatment, however if the procedure takes more sixty minutes it can be considered as difficult .[7]

During laparoscopic cholecystectomy operative findings hold the key to the surgical outcome and ability to complete the procedure laparoscopically.[8] A variety of scoring systems to determine if the laparoscopic cholecystectomy will be difficult or not have been developed using different parameters based on clinical assessment, radiographic findings, operative findings, and laboratory findings.[9] One such score is Gallbladder Operative Scoring System (G10) that is being studies to be used as a tool to predict not only the occurrence of "difficult cholecystectomy" but also the conversion of laparoscopy to explorative open cholecystectomy. In this scoring system there are total ten points and severity is classified based on the scores as "mild (<2)", "moderate (2-4)", "severe (5-7)" and "extreme (8-10)".[10] Converting laparoscopic to open cholecystectomy, in many cases, is a necessity and a safer option but laparoscopic surgeons tend to avoid this which may lead to poor patient outcome. For this purpose it is necessary that such a score is opted that can be assessed by surgeons just by patient chart and initial panoramic laparoscopic view to predict the

Correspondence: Dr Waleed Umer, Department of Gen Surgery, Combined Military Hospital, Rawalpindi Pakistan

possibility of difficult operation, as well as timely conversion to open approach to prevent increased operative time and possible complications.

METHODOLOGY

The cross-sectional study was conducted at General Surgery Unit of Combined Military hospital (CMH), Rawalpindi Pakistan, from Nov 2021 to Nov 2022 after obtaining approval from the Institutional Ethical Review Board (certificate number: 306). Sample size was calculated using WHO sample size calculator by taking anticipated frequency of conversion of laparoscopic to open cholecystectomy of 7.8%. [11] Non-probability consecutive sampling was used to collect data.

Inclusion Criteria: Patients aged 18-70 years, of either gender who were scheduled to have elective laparoscopic cholecystectomy were included.

Exclusion Criteria: Patients who had emergency cholecystectomy, those with a history of respiratory disease, coagulation issues, and those who were deemed unfit for surgery were excluded.

Patients provided written consent after being informed of the components, methodology and benefits of the study. Baseline demographic information including age of the study participants, gender, body mass index (BMI), Gallbladder operative score (G10) and category of severity ranging from mild to extreme were documented. Gallbladder operative score (G10)[12,13] is tabulated below in Table-I:

Patients who were placed on the operative list were subjected to laparoscopic cholecystectomy by standard procedure of using four-ports technique and using carbon dioxide at a pressure of 12mmHg to achieve "pneumoperitoneum". "Harmonic scalpel" was used for performing the dissection of the gallbladder. Cystic duct and cystic artery closure and sealing were accomplished using titanium clips. The gall bladder was removed from the gall bladder bed, and any bleeding or biliary leakage that was immediately apparent was stopped. In order to define the occurrence of "difficult laparoscopic cholecystectomy" operative time was documented, which was more than sixty minutes [14]. Alongside this, presence of each of the component of Gallbladder operative score (G10) was also documented. If the laparoscopic cholecystectomy was converted into open cholecystectomy, this was also documented. All the surgeries were performed by the same surgeons to minimize the risk of personal bias.

Data was analyzed by using Statistical Package for Social Sciences (SPSS) 20:00. Normality of variables was assessed by using Shapiro-Wilk test. Quantitative data was represented using mean with standard deviation and the median with Inter-Quartile Range (IQR). Qualitative data was represented by using percentage and frequency. Chi square test (for qualitative variables) and t-test (for quantitative variables) were applied and p of ≤0.05 was taken as significant.

RESULTS

In our study a total of 111 patients were included who were scheduled to undergo laparoscopic cholecystectomy. Baseline characteristics of the included patients is shown in the Table-II.

Frequency of various components of "Gallbladder operative score (G10)" were also studied and the findings are tabulated in Table-III.

Frequency of conversion of laparoscopic cholecystectomy to open cholecystectomy was 9(8.10%). Based on severity of G10 score, the frequency of conversion of laparoscopic cholecystectomy to open cholecystectomy in mild, moderate, severe and extreme G10 score was 0(0%), 0(0%), 8(32.00%) and 1(50.00%) respectively, which are tabulated in Table-IV.

We compared the frequency of each component of "Gallbladder operative score (G10)" in patients who had their laparoscopic cholecystectomy converted to open cholecystectomy against those who had

Table-I: Gallbladder Operative Score (G10)

Characteristic	Component	Score
Appearance	Gallbladder has less than 50% adhesions	1
	Gallbladder has more than 50% adhesions but is buried	2
	Gallbladder (GB) is completely buried	3
Access	> 30kg/m2 body mass index	1
	Presence of gallbladder adhesions due to previous surgery that limit current surgery	1
Contraction/Distension	Gallbladder cannot be grasped without decompression	1
	Distended/contracted gallbladder	1
	Impacted stone of more than 1cm in size that is stuck in "Hartmann's pouch"	1
Sepsis and Complications	Presence of pus or bile outside the GB	1
	Fistula	1

laparoscopic cholecystectomy. We found out that the frequency of components which have higher points was much higher in patients who had their surgery converted to open. Detailed head to head comparison of frequency of "Gallbladder operative score (G10)" components is depicted in Table-V

Table-II: Baseline characteristics (n=111)

Characteristics	n(%)
Age mean±SD	43.36±5.33 years
BMI a mean±SD	29.37±4.25 kg/m2
Gender	
Male	53(47.70%)
Female	58(52.30%)
Median G10 b score	3.00(1.00–8.00)
Severity	
Mild	20(18.00%)
Moderate	64(57.70%)
Severe	25(22.50%)
Extreme	2(1.80%)

a = Body Mass Index
b = Gallbladder Operative Score

Table-III: Baseline Frequency of Gallbladder Operative Score Components (n=111)

Component	n (%)
Appearance	
Gallbladder has less than 50% adhesions	32(28.80%)
Gallbladder has more than 50% adhesions but is buried	37(33.30%)
Gallbladder (GB) is completely buried	14(12.60%)
Access	
> 30kg/m2 body mass index	66(59.50%)
Presence of gallbladder adhesions due to previous surgery that limit current surgery	45(40.50%)
Contraction/Distension	
Gallbladder cannot be grasped without decompression	38(34.20%)
Distended/contracted gallbladder	20(18.02%)
Impacted stone of more than 1cm in size that is stuck in "Hartmann's pouch"	13(11.70%)
Sepsis and Complications	
Presence of pus or bile outside the GB	26(23.40%)
Fistula	3(2.70%)

Table-IV: Difference of Frequency of Conversion to Open Cholecystectomy by Severity of G10 Score (n=111)

Severity (n)	Converted to Open Cholecystectomy	Not Converted to Open Cholecystectomy	p-value
Mild (20)	0(0%)	20(100%)	
Moderate(64)	0(0%)	64(100%)	<0.001
Severe (25)	8(32.00%)	17(68.00%)	
Extreme (2)	1(50.00%)	1(50.00%)	

Mean operative time in our study was 61.48±17.67 minutes. Frequency of patients who had "difficult cholecystectomy" was 39(35.10%). Difference of median "Gallbladder Operating Score (G10)" in patients with "difficult cholecystectomy" and in patients with simple cholecystectomy was statistically insignificant (p=0.252). However, difference in median "Gallbladder Operating Score (G10)" in patients

among which laparoscopic cholecystectomy got converted to open cholecystectomy and patient who underwent laparoscopic cholecystectomy without conversion to open this score was statistically significant (p=0.003).

DISCUSSION

We conducted this cross sectional study with the aim to determine the ability of "Gallbladder Operating Score (G10)" to predict difficulty of surgery and subsequent conversion of laparoscopic to open cholecystectomy. We found out that amongst all the patients overall frequency of conversion of laparoscopic cholecystectomy was 8.10%. This was within the range of the conversion rates reported in previous studies [15,16].

In our study we found that G10 was higher in patients who had difficult cholecystectomy and underwent conversion of laparoscopic cholecystectomy to open one as compared to those who had simple cholecystectomy. This reflects that G10 has a strong ability to predict difficulty of surgery, prolong operating time and conversion of laparoscopic to open cholecystectomy.[17,18]

These findings were in consistent with the findings of studies conducted both locally and internationally[11,19,20] where it was found that G10 is a highly useful tool to predict difficulty of surgery and conversion of laparoscopic to open cholecystectomy. They also found out that the difference of these scores between the study participants who experienced conversion of laparoscopic to open cholecystectomy as compared to those who had their laparoscopic cholecystectomy completed was statistically significant, which was consistent with what we observed in our study.

Table-V: Difference of Frequency of Components of G10 Score between Conversion to Open Cholecystectomy Versus No Conversion to Open Cholecystectomy (n=111)

Component	Conversion to Open		*p*-value
	Yes (n=9)	**No (n=102)**	
Appearance			
Gallbladder has less than 50% adhesions	0(0%)	32(31.40%)	
Gallbladder has more than 50% adhesions but is buried	4(44.40%)	33(32.30%)	<0.001
Gallbladder (GB) is completely buried	5(55.60%)	9(8.80%)	
Access			
> 30kg/m2 body mass index	5(44.40%)	61(59.80%)	
Presence of gallbladder adhesions due to previous surgery that limit current surgery	4(55.60%)	41(40.20%)	0.803
Contraction/Distension			
Gallbladder cannot be grasped without decompression	2(22.20%)	37(36.20%)	
Distended/contracted gallbladder	4(44.40%)	15(14.70%)	0.001
Impacted stone of more than 1cm in size that is stuck in "Hartmann's pouch"	3(33.40%)	9(8.80%)	
Sepsis and Complications			
Presence of pus or bile outside the GB	9(100%)	17(16.70%)	<0.001
Fistula	0(0%)	3(2.90%)	

Despite these highly promising results, owing to the ever-changing nature of medical sciences, it is suggested that further studies should be carried out which should focus on assessing this useful score's ability to predict difficulty of surgery and conversion of laparoscopic to open cholecystectomy.

LIMITATIONS OF STUDY

The limitations of our study was that the follow-up time was limited.

ACKNOWLEDGEMENTS

We are thankful to Dr Yasir Umer for their support and guidance throughout our research which was very helpful to us in completion of our research project.

CONCLUSION

"Gallbladder Operating Score (G10)" is helpful in predicting the difficulty cholecystectomy and conversion of laparoscopic to open cholecystectomy.

Conflict of Interest: None.

Authors Contribution

Following authors have made substantial contributions to the manuscript as under:

WU: Data acquisition, data analysis, drafting the manuscript, critical review, approval of the final version to be published.

RQN: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

FS, MT: Conception, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

REFERENCES

1. Hasan MM, Reza E, Khan MR, Laila SZ, Rahman F, Mamun MH. Anatomical and congenital anomalies of extra hepatic biliary system encountered during cholecystectomy. Mymensingh Med J 2013; 22(1): 20-26.
2. Song ST, Shi J, Wang XH, Guo YB, Hu PF, Zhu F, et al. Prevalence and risk factors for gallstone disease: A population-based cross-sectional study. J Dig Dis 2020; 21(4): 237-245. https://doi.org/10.1111/1751-2980.12857
3. Salinas G, Velásquez C, Saavedra L, Ramírez E, Angulo H, Tamayo JC, et al. Prevalence and risk factors for gallstone disease. Surg Laparosc Endosc Percutan Tech 2004; 14(5): 250-253. https://doi.org/10.1097/00129689-200410000-00003
4. Lodha M, Chauhan AS, Puranik A, Meena SP, Badkur M, Chaudhary R, et al. Clinical profile and evaluation of outcomes of symptomatic gallstone disease in the senior citizen population. Cureus 2022; 14(8): e28492. https://doi.org/10.7759/cureus.28492
5. Bagla P, Sarria JC, Riall TS. Management of acute cholecystitis. Curr Opin Infect Dis 2016; 29(5): 508-513. https://doi.org/10.1097/QCO.0000000000000297
6. Mou D, Tesfasilassie T, Hirji S, Ashley SW. Advances in the management of acute cholecystitis. Ann Gastroenterol Surg 2019; 3(3): 247-253. https://doi.org/10.1002/ags3.12240
7. Mohammed AA, Arif SH. Laparoscopic cholecystectomy for left-sided gall bladder in situs inversus totalis patient, a technically demanding procedure. Ann Med Surg 2019; 47: 1-4. https://doi.org/10.1016/j.amsu.2019.09.002.
8. Di Buono G, Romano G, Galia M, Amato G, Maienza E, Vernuccio F, et al. Difficult laparoscopic cholecystectomy and preoperative predictive factors. Sci Rep 2021; 11(1): 2559. https://doi.org/10.1038/s41598-021-81938-6
9. Bhondave ST, Dash N, Thipse VJ, Gadekar JM. Proposed diagnostic scoring system to predict difficult laparoscopic cholecystectomy. J Med Sci Clin Res 2017; 5(12): 31682-31688. https://doi.org/10.18535/jmscr/v5i12.67
10. Sugrue M, Sahebally SM, Ansaloni L, Zielinski MD. Grading operative findings at laparoscopic cholecystectomy- a new scoring system. World J Emerg Surg 2015; 10: 1-8. https://doi.org/10.1186/s13017-015-0005-x

11. Jameel SM, Bahaddin MM, Mohammed AA. Grading operative findings at laparoscopic cholecystectomy following the new scoring system in Duhok governorate: Cross sectional study. Ann Med Surg 2020; 60: 266-270. https://doi.org/10.1016/j.amsu.2020.10.035

12. Pourhoseingholi MA, Vahedi M, Rahimzadeh M. Sample size calculation in medical studies. Gastroenterol Hepatol Bed Bench 2013; 6(1): 14-17.

13. Sugrue M, Coccolini F, Bucholc M, Johnston A; Contributors from WSES. Intra-operative gallbladder scoring predicts conversion of laparoscopic to open cholecystectomy: a WSES prospective collaborative study. World J Emerg Surg 2019; 14: 8 https://doi.org/10.1186/s13017-019-0230-9

14. Veerank N, Togale MD. Validation of a scoring system to predict difficult laparoscopic cholecystectomy: a one-year cross-sectional study. J West Afr Coll Surg 2018; 8(1): 23-39.

15. Mishra P, Pandey CM, Singh U, Gupta A, Sahu C, Keshri A. Descriptive statistics and normality tests for statistical data. Ann Card Anaesth 2019; 22(1): 67-72. https://doi.org/10.4103/aca.ACA_157_18

16. Livingston EH, Rege RV. A nationwide study of conversion from laparoscopic to open cholecystectomy. Am J Surg 2004; 188(3): 205-211. https://doi.org/10.1016/j.amjsurg.2004.06.013

17. Hussain S, Aslam V, Khan MS, Alam W, Khan SM, Jan WA. Frequency and causes of conversion of laparoscopic cholecystectomy into open cholecystectomy. Med Forum 2015; 26(5): 13-16.

18. Sakpal SV, Bindra SS, Chamberlain RS. Laparoscopic cholecystectomy conversion rates two decades later. JSLS 2010; 14(4): 476-483. https://doi.org/10.4293/108680810X12924466007926

19. Ahmed N, Hassan MU, Tahira M, Samad A, Rana HN. Intra-operative predictors of difficult cholecystectomy and conversion to open cholecystectomy - a new scoring system. Pak J Med Sci 2018; 34(1): 62-66. https://doi.org/10.12669/pjms.341.13302

20. Gupta S, Anand K, Paliwal P, Baghel AS. Validation of intra-operative scoring system for difficult laparoscopic cholecystectomy. Int Surg J 2022; 9(11): 1842-1850. https://doi.org/10.18203/2349-2902.isj20222939

....