

Early Complications in Acute versus Elective Cases of Laparoscopic Cholecystectomy in Tertiary Hospitals: A Comparative Study

Raza Haider, Muhammad Qasim Butt, Jamil Salamat Ullah, Mansoor Tariq Azim, Afnan Akbar

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

ABSTRACT

Objective: To correlate the operative findings of patients undergoing laparoscopic cholecystectomy, either acute or elective, with surgical complications and conversion to open cholecystectomy.

Study Design: Comparative cross-sectional study.

Place and Duration of Study: Combined Military Hospital and Pak-Emirates Military Hospital, Rawalpindi Pakistan, from Jul 2021 to Mar 2022.

Methodology: Data from patients who underwent laparoscopic cholecystectomy was collected after gaining consent. Patients were evaluated for the correlation of operative findings of acute and nonacute gallbladder cases with the development of complications and conversion to open cholecystectomy.

Results: Out of 250 patients, 205 were non-acute cases, whereas 45 were acute. The most common intraoperative complication was iatrogenic perforation of gallbladder 73(29.2%); more common in elective cases 49(19.6%) than in acute cases 24(9.6%). Post-operative complications included sub-hepatic collections 3(1.2%) and port site infections 2(0.8%). There were six overall conversions (2.4%), of which 3(1.2%) occurred in acute gallbladder cases and 3 in elective gallbladder. Acute cases were significantly more likely to be converted to open operations ($p=0.039$). They were found to have a significant association with gallstone spillage ($p<0.001$), iatrogenic perforation of the gallbladder ($p<0.001$), bile leakage ($p=0.018$), and subhepatic collection ($p=0.024$).

Conclusion: The likelihood of surgical complications and conversion to open procedure can be accurately predicted by the acute gallbladder status pre-operatively. It is thus important to consider these outcomes when commencing post-operative care.

Keywords: Complications, Gallbladder, Laparoscopic cholecystectomy

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INTRODUCTION

Gallstone disease (GSD) is among the most prevalent surgical disorders globally, affecting 5-20% of Asian and 20% of European and American populations.¹ Studies in the USA have found that 20 million individuals, or 15% of the population, suffer from GSD.² In Pakistan, two studies in urban centres have found the prevalence of GSD to be between 9%³ and 10%.⁴ of the population, with both these studies showing females approximately three times more likely to be affected than males.

Studies have shown that despite a lower rate of intraoperative and post-operative complications in patients undergoing interval cholecystectomy, the preferred approach is early cholecystectomy due to decreased hospital stay and better financial outcomes.^{5, 6}

Laparoscopic cholecystectomy is the gold standard of treatment of GSD.^{7,8} While well-established in the West, this procedure is now being performed in many tertiary care hospitals with access to the

resources needed.⁹ However, literature regarding the safety and effectiveness of laparoscopic cholecystectomies in Pakistan remains limited. This study aims to address the gap in the literature. Our objectives are to determine the intraoperative and post-operative complications in laparoscopic cholecystectomies and to compare the outcomes of early and elective cholecystectomies.

METHODOLOGY

The comparative cross-sectional study was conducted at Pak-Emirates Military Hospital and Combined Military Hospital Rawalpindi from July 2021 to March 2022. The sample size was calculated using the WHO sample size calculator, taking a reported prevalence of intra-operative complications of 13.1%.¹⁰ Ethical approval was sought from the Ethical Review Committee (IERB approval certificate number 240).

Inclusion Criteria: All patients undergoing laparoscopic cholecystectomy for gallstone disease who developed post-operative complications during their initial indoor stay or presented in an emergency after being discharged from the hospital within 14 days were included.

Correspondence: Dr Raza Haider, Department of Surgery, Pak Emirates Military Hospital, Rawalpindi Pakistan

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Exclusion Criteria: Patients who developed complications after the initial 14 days postoperatively were excluded.

Total Leukocyte Count was also measured and was divided into two categories, raised and normal, with the cutoff value being $11.0 \times 10^3 / \text{mm}^3$. Ultrasonography was also done, with gallbladder thickening $>2.99 \text{mm}$ considered significant. The instrument used for the stratification of operative difficulty was the Nassar scale. This validated scale divides cholecystectomy findings into four categorical

bladder presentation was seen in 5(18.0%) of the patients, of which 43(17.55%) were valid cases, whereas 205(82.0%) were elective cases out of which 202(82.44%) were valid cases.

In per-operative complications, 72 (28.8%) of our sample were bleeding. The most common bleeding site was from vessels adjacent to the gallbladder 64. Per-operative complications were seen in 112 (45.7%) valid cases, 245 as shown in Table-I. The most common complication was iatrogenic gallbladder perforation, which was seen in 73(29.8%) valid cases.

Table-I: Per-operative Complications showing bleeding, Iatrogenic Perforation of Gallbladder and Bile Leak (n=250)

Per-operative Complications		Case Presentation	
		Acute n(%)	Elective n(%)
Bleeding	Bleeding from trocar site/ Veeres Needle	0	5(2.5%)
	Bleeding adjacent to gallbladder	14(32.60%)	50(24.80%)
	Bleeding from cystic artery	0	1(0.50%)
	Bleeding from greater omentum	(2.30%)	1(0.50%)
	Gall stone spillage	13(30.20%)	12(5.90%)
Iatrogenic perforation of Gall Bladder	-	24(55.80%)	49(24.30%)
Bile leak	-	14(32.60%)	34(16.80%)

outcomes based on physical manifestations of the gallbladder, cystic pedicles, and adhesions.¹¹ Our study considered presentations with Grade III and above difficult procedures. They were characterized by deep gallbladder fossa, acute cholecystitis, fibrosis, short or obscured pedicle, and dense adhesions involving hepatic flexure and duodenum.

Gallbladders were divided into acute and elective based on the presence or absence of inflammation found operatively. The acute cases in this study are those gallbladders found acutely inflamed per-operatively. These acute gallbladders were mostly consistent with Grades III and IV on the Nassar scale for operative difficulty. All other cases were considered elective/non-acute. A total of 245 cases were defined as valid cases due to laparoscopic dissection being done. There were six conversions to open cholecystectomy, out of which five conversions were immediately done upon laparoscopic visualization of the gallbladder.

Data analysis was done using Statistical Package for the Social Sciences (SPSS) version 26:00 and Microsoft Excel version 16.70. Quantitative variables were expressed as Mean±SD and qualitative variables were expressed as frequency and percentages. Chi-square test was applied to explore the inferential statistics. The *p*-value of ≤ 0.05 was considered statistically significant.

RESULTS

Out of the 250 participants of the study, 115 (46.0%) were male, while 135(54.0%) were female. The mean age was 50.90 ± 15.21 years. Acute Gall-

The post-operative complication rate was particularly low 5(2.04%) which depicts the accurate pre-operative diagnosis and high-quality standard of post-op care given to patients. The complications, along with their distribution among acute and elective cases, are shown in Table-II. The Figure shows acute cases tend to behave more notoriously in the outcome of complications than elective cases.

Table-II: Post-Operative Complications showing Subhepatic Collection and Port Site Infection (n=250)

Post-operative Complications	Case Presentation	
	Acute n(%)	Elective n(%)
Subhepatic collection	2(4.7%)	1(0.5%)
Port site infection	0	2(1%)

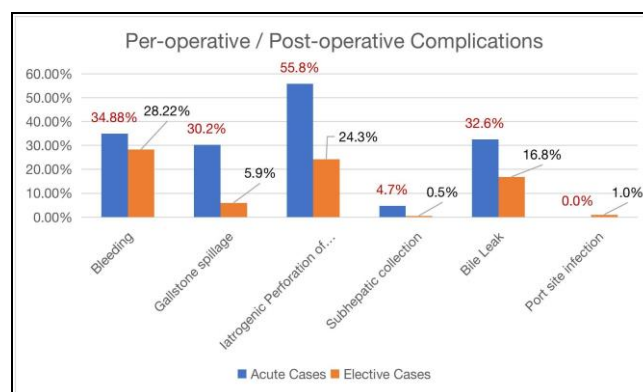


Figure: Comparison of Per-Operative and Post-Operative Complications in Acute and Elective Cases (n=250).

Nassar grades were a quantification of operative difficulty. Most cases had a Nassar Grade 3, totalling 87(34.8%). The frequency of occurrence of at least one complication within each category of operative difficulty is shown in Table-III. Per- and

post-operative complications were more likely to occur at higher Nassar grades. Of 109 cases with high operative difficulty (Nassar grades 3 and 4), 45 (41.3%) were acute presentations, while 64(58.7%) were non-acute, thus falling into the elective state. There were six conversions to open surgery, 3 of them happening in acute, all of which were seen in surgeries with high operative difficulty, denoted by Nassar Grades III and IV.

Table-III: The Frequency of Complication within each category of Nassar Grades of Difficulty

Nassar Grades of Difficulty		Complications	
		Per-operative n(%)	Post-operative n(%)
Operative Difficulty	Grade-I	19(22.6%)	8(9.5%)
	Grade-II	25(43.9%)	11(19.3%)
	Grade-III	56(64.4%)	23(26.4%)
	Grade-IV	12(54.5%)	9(40.9%)
Total		112(44.8%)	51(20.4%)

DISCUSSION

Our results show a strong relationship between the clinical presentation of gallstone disease and the complications. Generally, acute presentations are more likely to encounter complications. Bleeding complications can occur at any stage of laparoscopic cholecystectomy, and are due to various etiologies, including surgical inexperience, non-ideal environmental conditions, and improper trocar insertion.^{11,12} Slippage of cystic artery clips is a common cause of major bleeding and could necessitate conversion to open operation. Various multicenter studies have found bleeding during laparoscopic cholecystectomies to range from 2.3%, documented in one study.¹³ to 8.89%, as studied by Radunovic *et al.*¹⁰ In our set-up, bleeding was a common complication and occurred at a much higher than in western hospitals.

Gallstone spillage was the only complication in our study to show a significant difference between acute and non-acute/elective cases when operative difficulty was factored in.

Surgical wound infection is a complication that occurs more frequently in open cholecystectomy than in laparoscopic cholecystectomy.^{14,15} In our study, only 2(0.82%) patients reported to have port site infection.

Iatrogenic biliary tree injury was not observed in our study. Frilling *et al.*¹⁶ have reported a 0.5 – 1.4% rate of biliary tract injuries in laparoscopic cholecystectomy. According to him, improper approach to the extrahepatic biliary tree is also a major factor in causing iatrogenic injuries apart from the “learning curve” of the surgeon. The bile duct injuries were 0.3%-1% in a study by Singh *et al.*¹⁷

emphasizing the importance of various anatomic landmarks that help in safe dissection and prevent bile duct and vascular injury. Nuzzo *et al.*¹⁸ conducted a multicenter survey of 184 hospitals across Italy, reporting a 0.42% incidence of bile duct injury. The most frequent cause was inaccurate identification of vital structures in the hepatic pedicle (36.8%). The higher incidence of bile duct injury was reported during cholecystitis ($p<0.01$).

LIMITATIONS OF STUDY

Due to a relatively low sample size of 250, several complications, mainly biliary tree injury, were not observed. In addition, conversions to open operations needed to be more extensive to draw reliable conclusions from our data. Future studies on this topic aim for a much larger sample size so that all surgery outcomes can be observed. One limitation related to data collection categories was that the amount of bleeding needed to be quantified. Doing so would have led to a more accurate picture of the severity of bleeding complications.

CONCLUSIONS

While laparoscopic cholecystectomy has been accepted as the gold standard for treating gallstone disease, surgeons must know the factors that could lead to complications. A pre-emptive knowledge of gallbladder presentation can help determine the risk of complications, which can help guide the management of the disorder during and after the operation.

Authors Contribution

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

RH: & MQB: Data acquisition, data analysis, critical review, approval of the final version to be published.

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

AA: Concept, 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. Chuang SC, Hsi E, Lee KT. Genetics of gallstone disease. *Adv Clin Chem* 2013; 60: 143-185. <https://doi.org/10.1016/b978-0-12-407681-5.00005-2>.
2. Everhart JE, Ruhl CE. Burden of digestive diseases in the United States Part III: Liver, biliary tract, and pancreas. *Gastroenterology* 2009; 136(4): 1134-1144.
3. Channa NA, Khand FD, Bhangar MI, Leghari MH. Surgical incidence of Cholelithiasis in Hyderabad and adjoining areas (Pakistan). *Pak J Med Sci* 2004; 20: 1.
4. Bilal M, Haseeb A, Saad M, Ahsan M, Raza M, Ahmed A, et al. The Prevalence and Risk Factors of Gallstone among Adults in Karachi, South Pakistan: A Population-Based Study. *Glob J Health Sci* 2016; 9(4): 106.

Elective Cases of Laparoscopic Cholecystectomy

5. Browning JD, Horton JD. Gallstone disease and its complications. *Semin Gastrointest Dis* 2003 Oct; 14(4): 165-177.
 6. de Mestral C, Rotstein OD, Laupacis A, Hoch JS, Zagorski B, Alali AS, et al. Comparative operative outcomes of early and delayed cholecystectomy for acute cholecystitis: a population-based propensity score analysis. *Ann Surg*. 2014 ; 259(1): 10-15. <https://doi.org/10.1097/SLA.0b013e3182a5cf36>.
 7. Gandhi D, Ojili V, Nepal P, Nagar A, Hernandez-Delima FJ, Bajaj D, et al. A pictorial review of gall stones and its associated complications. *Clin Imaging* 2020 ; 60(2): 228-236. <https://doi.org/10.1016/j.clinimag.2019.11.015>.
 8. Sain AH. Laparoscopic cholecystectomy is the current “gold standard” for the treatment of gallstone disease. *Ann Surg* 1996; 224(5): 689-690.
 9. A Tran A, Hoff C, Polireddy K, Neymotin A, Maddu K. Beyond acute cholecystitis-gallstone-related complications and what the emergency radiologist should know. *Emerg Radiol* 2022; 29(1): 173-186. <https://doi.org/10.1007/s10140-021-01999-y>.
 10. Radunovic M, Lazovic R, Popovic N, Magdelinic M, Bulajic M, Radunovic L, et al. Complications of Laparoscopic Cholecystectomy: Our Experience from a Retrospective Analysis. *Open Access Maced J Med Sci* 2016 ; 4(4): 641-646.
 11. Griffiths EA, Hodson J, Vohra RS, Marriott P, Katbeh T, Zino S, et al. Utilisation of an operative difficulty grading scale for laparoscopic cholecystectomy. *Surg Endosc* 2019; 33(1): 110-121. <https://doi.org/10.1008/s10564560-021-2445>
 12. Kaushik R. Bleeding complications in laparoscopic cholecystectomy: Incidence, mechanisms, prevention and management. *J Minim Access Surg* 2010; 6(3): 59-65.
 13. Duca S, Bălă O, Al-Hajjar N, Lancu C, Puia IC, Munteanu D, et al. Laparoscopic cholecystectomy: incidents and complications. A retrospective analysis of 9542 consecutive laparoscopic operations. *HPB (Oxford)* 2003; 5(3): 152-158. <https://doi.org/10.1080/13651820310015293>.
 14. Boni L, Benevento A, Rovera F, Dionigi G, Di Giuseppe M, Bertoglio C, et al. Infective complications in laparoscopic surgery. *Surg Infect (Larchmt)* 2006; 7 Suppl 2: S109-111.
 15. Chuang SC, Lee KT, Chang WT, Wang SN, Kuo KK, Chen JS, et al. Risk factors for wound infection after cholecystectomy. *J Formos Med Assoc* 2004; 103(8): 607-612.
 16. Frilling A. Major bile duct injuries after laparoscopic cholecystectomy: a tertiary center experience. *J Gastrointestinal Surg* 2004 ; 8(6): 679-685.
 17. Singh K, Ohri A. Anatomic landmarks: their usefulness in safe laparoscopic cholecystectomy. *Surg Endosc* 2006 ; 20(11): 1754-1758.
 18. Nuzzo G. Bile Duct Injury During Laparoscopic Cholecystectomy: Results of an Italian National Survey on 56 591 Cholecystectomies. *Arch Surg* 2005; 140(10): 986.
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