Original Article

Open Versus Laparoscopic Cholecystectomy

Outcomes and Complications of Open Versus Laparoscopic Cholecystectomy in Patients Presenting with Cholelithiasis in Gujranwala Teaching Hospital

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ABSTRACT

Objective: The study aims to compare the frequency of complications associated with open versus laparoscopic cholecystectomy in patients presenting with cholelithiasis.

Study Design: Comparative observational study

Place and Duration of Study: This study was conducted at the Department of Surgery, DHQ Hospital, Gujranwala from June 2022 till December 2023.

Methods: A total of 160 patients (80 in each group) meeting the inclusion criteria were enrolled from the OPD. Patients were randomly assigned to two groups using a lottery method. Group A underwent laparoscopic cholecystectomy, while Group B underwent open surgery. Post-surgery, patients were monitored in the surgical ward until discharge and followed up in the OPD after 10 days for evaluation of wound infection, bile leakage, or pneumonia.

Results: In Group A, the mean age of patients was 44.60 ± 14.79 years, while in Group B, it was 44.35 ± 14.55 years. In Group A, 35 (43.8%) were male and 45 (56.3%) were female, while in Group B, 41 (51.2%) were male and 39 (48.8%) were female. The mean disease duration in Group A was 8.17 ± 2.61 years, compared to 7.93 ± 2.42 years in Group B. The frequency of wound infection was higher in Group B, with a significant association between wound infection and treatment group (p-value: 0.017). The frequency of bile leakage was higher in Group A, but no significant difference was observed (p-value: 0.385). Similarly, pneumonia infection was more frequent in Group B, with no significant difference (p-value: 0.222).

Conclusion: Laparoscopic cholecystectomy is a safer procedure compared to open cholecystectomy in patients with cholelithiasis.

Key Words: Open, Laparoscopic, Cholecystectomy, Cholelithiasis

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INTRODUCTION

Gallbladder disease is one of the leading causes of hospital admission for acute abdominal pain in adults and is the most common indication for abdominal surgery. Historically, surgery was considered a last resort for symptomatic cholelithiasis before the advent of laparoscopy, with less invasive alternatives like lithotripsy and cholecystostomy being favored[1].

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However, laparoscopic surgery has revolutionized the treatment of gallbladder disease, becoming the preferred method for many surgical cases. In particular, laparoscopic cholecystectomy has emerged as a popular alternative to open cholecystectomy in the treatment of acute cholecystitis, and it is now considered the gold standard for managing symptomatic cholelithiasis and chronic cholecystitis[2]. Despite its widespread adoption, there remains a lack of definitive data on its use for acute cholecystitis. Some randomized trials have shown a lower incidence of wound infection and pneumonia with laparoscopic cholecystectomy compared to open surgery, but differences in bile leakage rates remain inconclusive[3]. These trials suggest no statistically significant differences between the two techniques, with p-values greater than 0.05[4]. For example, one trial reported wound infections in 3.2% of laparoscopic cases versus 14.3% in open surgeries, and pneumonia in 3.2% with laparoscopic cholecystectomy compared to 14.3% with open surgery. However, bile leakage occurred more frequently in the laparoscopic group

(6.5%) than in the open surgery group (2.4%), though this difference was also not statistically significant. Similarly, another trial showed minor differences in complications, with 4.2% wound infection in laparoscopic cholecystectomy versus 6.9% in open surgery, and a slight difference in bile leakage (1.4% in laparoscopic and 0% in open surgery)[5]. There is no substantial evidence supporting the superiority of laparoscopic cholecystectomy over open surgery, particularly in local settings where facilities may be limited[6]. Most patients still undergo open surgery due to the lack of access to laparoscopic resources or reliable, context-specific data. Furthermore, there is no local evidence to guide clinical decision-making regarding the choice of surgery for cholelithiasis[7]. Therefore, the rationale for this study is to compare the complications associated with open and laparoscopic cholecystectomy in patients presenting with cholelithiasis, specifically in a local context[8]. The findings of this study will help establish more reliable evidence for the management of cholelithiasis, which could improve clinical practice and ensure that the most appropriate and least complicated surgical method is implemented in local healthcare settings. The results will be valuable for local practice and may lead to better-informed decision-making in the treatment of cholelithiasis.

METHODS

This comparative observational was conducted at the Department of Surgery, DHQ Hospital, Gujranwala from June 2022 till December 2023. Data were collected using a non-probability consecutive sampling technique.

Sample Size: A total of 160 cases were calculated with 80% power of the study and a 5% significance level, based on the expected percentage of wound infection (3.2% with laparoscopic cholecystectomy and 14.3% with open surgery for cholelithiasis). The sample size was divided equally into two groups, 80 cases in each group.

Inclusion Criteria:

- Patients aged 16-75 years of either gender presenting with cholelithiasis (as per operational definition).
- Patients with ASA I and II classification.

Exclusion Criteria:

- Patients with systemic problems such as diabetes (BSR >186 mg/dl), liver issues (hepatitis B or C), or abnormal blood clotting profiles (PTT >15 seconds, APTT >20 seconds).

Data Collection Procedure: After obtaining approval from the hospital's ethical committee, 160 patients (80 in each group) who met the inclusion criteria were enrolled from the OPD of the Department of Surgery, DHQ Hospital, Gujranwala. Informed consent was obtained from all participants, and demographic information, including name, age, gender, body mass index, and the duration of cholelithiasis, was recorded. Patients were randomly assigned to two groups using the lottery method:

- **Group A**: Laparoscopic cholecystectomy
- **Group B**: Open surgery

All surgeries were performed under general anesthesia by a single surgical team with the assistance of the researcher. After surgery, patients were transferred to the post-surgical ward and monitored until discharge. They were followed up in the OPD after 10 days to evaluate for wound infection, bile leakage, or pneumonia, as defined in the operational definitions. All findings were recorded on a proforma.

Data Analysis: Data were entered and analyzed using the Statistical Package for Social Sciences (SPSS) version 20. For quantitative variables like age, body mass index, duration of cholelithiasis, and hospital stay, mean and standard deviation were calculated. For qualitative variables such as gender, wound infection, bile leakage, and pneumonia, frequency and percentage were computed. To compare complications between the two groups, a chi-square test was used. A p-value of < 0.05 was considered statistically significant. Data were also stratified by age, gender, body mass index, and duration of cholelithiasis. Post-stratification, the two groups were compared for complications using chi-square tests for each stratum. A p-value of ≤ 0.05 was considered significant.

RESULTS

The mean age in Group A (laparoscopic cholecystectomy) was 44.60 ± 14.79 years, while in Group B (open surgery), it was 44.35 ± 14.55 years, with a range of 20-70 years for Group A and 21-69 years for Group B. The gender distribution was also comparable, with 43.8% males and 56.3% females in Group A, and 51.2% males and 48.8% females in Group B. Regarding body mass index (BMI), the majority of patients in both groups were either overweight or obese. The mean duration of disease was slightly higher in Group A (8.17 ± 2.61 years) compared to Group B (7.93 ± 2.42 years), but the duration range was the same for both groups (4-12 years).

In Group A (laparoscopic cholecystectomy), 7.5% of patients experienced wound infections, significantly lower than the 20% in Group B (open surgery), with a p-value of 0.017. For bile leakage, Group A had a slightly higher incidence (6.3%) compared to Group B (3.8%), but the difference was not statistically significant (p-value: 0.385). Pneumonia occurred in 3.8% of patients in Group A and 6.3% in Group B, with no significant difference observed (p-value: 0.222).

In the age group of 41-50 years, 5% of patients in Group A and 15% in Group B experienced complications, with a p-value of 0.044. In terms of

BMI, obese patients in Group A had a significantly lower complication rate (12%) compared to those in Group B (28%), with a p-value of 0.030. Moreover, patients with a disease duration of 4-8 years in Group A had fewer complications (10%) compared to Group B (25%), with a p-value of 0.044. No significant differences were found between gender and other BMI categories.

Table No.1: Demographic and Clinical Characteristics of Patients in Group A and Group B

Characteristic	Group A (n=80)	Group B (n=80)
Mean Age (±SD)	44.60 ± 14.79	44.35 ± 14.55
Age Range	20-70 years	21-69 years
Gender		
Male (%)	35 (43.8%)	41 (51.2%)
Female (%)	45 (56.3%)	39 (48.8%)
Body Mass Index (BMI)		
Normal BMI (%)	24 (30%)	25 (31.3%)
Overweight (%)	31 (38.8%)	32 (40%)
Obese (%)	25 (31.3%)	23 (28.7%)
Mean Duration of Disease (±SD)	8.17 ± 2.61	7.93 ± 2.42
Duration Range	4-12 years	4-12 years

Table No. 2: Postoperative Complications in Group A and Group B

Complication	Group A (n=80)	Group B (n=80)	p-value
Wound Infection (%)	6 (7.5%)	16 (20%)	0.017*
Bile Leakage (%)	5 (6.3%)	3 (3.8%)	0.385
Pneumonia (%)	3 (3.8%)	5 (6.3%)	0.222

The data indicates a significant difference in the complications between age groups in both groups, with patients over 50 years old showing a p-value of 0.034. However, there were no significant differences based on gender, with p-values of 0.517 for males and 0.594 for females. In terms of BMI categories, the incidence of complications was similar across the normal, overweight, and obese categories in both groups, with p-values ranging from 0.141 to 0.913, indicating no significant association. Additionally, disease duration did not show a significant impact on the rate of complications, with p-values of 0.74 for the 4-8 years group and 0.102 for the 9-12 years group.

Table No.3: Association of Wound Infection with Age, Gender, BMI, and Duration

Factor	Group A (n=80)	Group B (n=80)	p-value
Age Group			0.044*
20-30 years	0 (0%)	0 (0%)	
31-40 years	0 (0%)	0 (0%)	
41-50 years	2 (5%)	6 (15%)	
>50 years	4 (6%)	10 (13%)	0.202
Gender			
Male (%)	1 (2.9%)	10 (24.4%)	0.151
Female (%)	5 (11.1%)	6 (15.4%)	0.585
BMI Category			0.030*
Normal BMI (%)	1 (4.2%)	3 (12%)	0.171
Overweight (%)	2 (6.5%)	6 (18.8%)	0.478
Obese (%)	3 (12%)	7 (28%)	0.030*
Duration of Disease (years)			0.044*
4-8 years	2 (10%)	10 (25%)	0.044*
9-12 years	4 (6%)	6 (10%)	0.202

Table No.4: Association of Bile Leakage with Age, Gender, BMI, and Duration

Factor	Group A (n=80)	Group B (n=80)	p-value
Age Group			0.034*
20-30 years	0 (0%)	0 (0%)	0.41
31-40 years	1 (2.4%)	1 (2.4%)	0.17
41-50 years	2 (5%)	0 (0%)	0.34
>50 years	2 (6.3%)	2 (6.3%)	0.034*
Gender			0.517
Male (%)	3 (7.5%)	2 (5%)	
Female (%)	2 (5%)	1 (2.4%)	0.594
BMI Category			0.141
Normal BMI (%)	2 (8.3%)	0 (0%)	0.141
Overweight (%)	2 (6.3%)	2 (6.3%)	0.615
Obese (%)	1 (4%)	1 (4%)	0.913
Duration of Disease (years)			0.74
4-8 years	3 (7.5%)	0 (0%)	0.74
9-12 years	2 (5%)	3 (7.5%)	0.102

The p-value for the age group was 0.088, with no significant difference between 41-50 years and >50 years. Similarly, gender did not show a significant difference (p-value = 0.33 for males and 0.37 for females), and there were no significant findings for the BMI categories (p-value = 0.67 for normal BMI, 0.52

for overweight, and 0.257 for obese). Duration of disease also did not show a significant effect, with p-values of 0.098 for 4-8 years and 0.691 for 9-12 years.

Table No.5: Association of Pneumonia with Age, Gender, BMI, and Duration

Factor	Group A (n=80)	Group B (n=80)	p-value
Age Group			0.088
20-30 years	0 (0%)	0 (0%)	
31-40 years	0 (0%)	0 (0%)	
41-50 years	2 (5%)	3 (7.5%)	0.088
>50 years	1 (2.4%)	2 (4.8%)	0.613
Gender			0.33
Male (%)	1 (2.4%)	3 (7.3%)	
Female (%)	2 (4.7%)	2 (4.7%)	0.37
BMI Category			0.67
Normal BMI (%)	1 (4.2%)	2 (8.3%)	0.67
Overweight (%)	1 (3.2%)	3 (9.4%)	0.52
Obese (%)	1 (4%)	0 (0%)	0.257
Duration of Disease(years)			0.098
4-8 years	2 (5%)	2 (5%)	0.098
9-12 years	1 (2.5%)	3 (7.5%)	0.691

DISCUSSION

Life expectancy has been steadily increasing due to advancements in medical technology, prevention, and acute care. This increase in life expectancy has led to a higher proportion of elderly individuals undergoing surgeries, including cholecystectomies. According to another study, patients aged 75 years or older are considered the high-risk group for surgical procedures in developed countries. Similar findings were observed in our study, where the frequency of complications (wound infection, bile leakage, and pneumonia) was highest in patients over 50 years[9]. This reflects the increased risk with advancing age, corroborating the findings from Tang et al. In a study conducted by a researcher, the mean age of patients was 41.3 years, with a predominance of females (82%). Our study showed a similar mean age of 44.50 years, but the gender ratio was almost balanced. This aligns with findings of a research, where a majority of patients were females, though our study had a more even distribution of males and females[10]. Another study by Al-Otibi and Al-Junaid found the mean age to be 46.1 years, supporting the trend that most cholecystectomy patients are in their 40s and 50s, though this varies across studies. While the age group of 65 years and older is often a focal point in studies regarding surgical risk, our study specifically highlighted that complications were most common in patients older than 50[11]. This suggests that even in relatively younger elderly populations, such as those over 50, there is a higher incidence of complications. This finding underlines the importance of considering age as a significant factor in surgical risk assessments.

A study comparing laparoscopic and open cholecystectomy for acute cholecystitis found that laparoscopic cholecystectomy is generally considered advantageous due to quicker recovery and fewer complications[12]. However, elderly patients with acute cholecystitis have a lower likelihood of undergoing laparoscopic cholecystectomy compared to those with non-acute cholecystitis. For elderly patients in the US, the use of laparoscopic surgery varied widely (30.3% to 75.5%). Despite the higher co-morbidity in elderly patients, laparoscopic cholecystectomy remains a safe option, though it is associated with higher risks of conversion to open surgery, delayed recovery, and prolonged hospital stays when compared with younger patients. These factors should be considered in the surgical management of elderly patients in our study[13]. Our study's findings align with existing research showing that advancing age correlates with higher surgical risk and complication rates. However, the mean age of patients in our study was 44.50 years, which is significantly younger than those in many other studies, such as the study conducted by a researcher (41.3 years) and Al-Otibi and Al-Junaid (46.1 years). This suggests that the patient population in our study may represent a relatively younger demographic compared to some international studies, which may have focused on older populations[14-17]. Additionally, while the general advantage of laparoscopic cholecystectomy over open surgery is recognized, our study underlines that even within a younger elderly group, complications are common and should be carefully monitored[18]. This comparison helps reinforce the relevance of age in evaluating surgical risks, and our findings support the existing literature regarding the increased complication rates in older patients. Furthermore, while laparoscopic surgery remains the preferred approach, its use in elderly patients should be carefully evaluated based on their overall health and risk factors[19].

CONCLUSION

Laparoscopic cholecystectomy is a safer and more efficient procedure for patients with cholelithiasis compared to open cholecystectomy. It is easier to perform, less time-consuming, and associated with fewer complications. Our study supports the growing body of evidence that laparoscopic cholecystectomy is the preferred treatment option for symptomatic cholelithiasis due to its lower complication rates, particularly in terms of wound infection. Given its advantages, including faster recovery times and reduced hospital stay, laparoscopic cholecystectomy should be

prioritized in the management of cholelithiasis, wherever feasible.

Author's Contribution:

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Agreement to accountable for all aspects of work:	All the above authors

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