



COMPARATIVE EVALUATION OF PERIOPERATIVE OUTCOMES IN LAPAROSCOPIC VERSUS OPEN CHOLECYSTECTOMY: A PROSPECTIVE OBSERVATIONAL STUDY FROM A TERTIARY CARE CENTER IN NORTH INDIA

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ABSTRACT

Background: Cholelithiasis is a common surgical condition requiring cholecystectomy as definitive management. Laparoscopic cholecystectomy has largely replaced open cholecystectomy due to its minimally invasive nature; however, comparative evaluation in regional settings remains essential.

Objectives: To compare perioperative outcomes between laparoscopic and open cholecystectomy in patients with symptomatic gallstone disease in a tertiary care hospital in North India.

Methods: A prospective comparative observational study was conducted from February 2012 to October 2012, including 90 patients diagnosed with symptomatic cholelithiasis. Patients were allocated into two groups: laparoscopic cholecystectomy (n=45) and open cholecystectomy (n=45). Data on operative time, postoperative pain, time to ambulation, duration of hospital stay, and complications were collected and analyzed using SPSS version 20.0. Statistical significance was considered at $p < 0.05$.

Results: Baseline demographic characteristics were comparable between the groups. The laparoscopic group demonstrated significantly shorter operative time compared to the open group. Postoperative pain scores were significantly lower in the laparoscopic group, with earlier ambulation and faster return to normal activities. The overall complication rate was significantly lower in the laparoscopic group (13.3%) compared to the open group (31.1%). Additionally, the duration of hospital stay was significantly shorter in the laparoscopic group (2.8 ± 0.9 days) compared to the open group (5.6 ± 1.4 days).

Conclusion: Laparoscopic cholecystectomy is a safe and effective alternative to open cholecystectomy, offering superior perioperative outcomes. It should be considered the preferred surgical approach for gallstone disease in tertiary care settings.

Keywords: Laparoscopic cholecystectomy; Open cholecystectomy; Gallstone disease; Postoperative outcomes; Minimally invasive surgery; Hospital stay

INTRODUCTION

Cholelithiasis is one of the most common gastrointestinal disorders worldwide, with a prevalence ranging from 10% to 20% in developed countries and an increasing trend in developing nations due to changing dietary patterns and lifestyle factors [1]. Gallstone disease represents a significant burden on healthcare systems, accounting for a substantial proportion of elective and emergency abdominal surgeries. In India, the prevalence varies geographically, with higher rates reported in northern regions compared to southern parts, possibly due to dietary habits, genetic predisposition, and environmental influences [2].

Cholecystectomy remains the definitive treatment for symptomatic gallstone disease and its complications, including acute cholecystitis, choledocholithiasis, and pancreatitis [3]. Traditionally, open cholecystectomy was the standard surgical approach since its introduction in the late 19th century. However, it is associated with considerable postoperative pain, longer hospital stay, delayed return to normal activities, and higher morbidity [4].

The introduction of laparoscopic cholecystectomy in the late 1980s revolutionized the management of gallstone disease and is now considered the gold standard treatment for uncomplicated cases [5]. The minimally invasive nature of laparoscopic surgery offers several advantages, including reduced postoperative pain, shorter hospital stay, faster recovery, improved cosmetic outcomes, and lower wound-related complications [6]. Consequently, it has largely replaced open cholecystectomy in routine surgical practice worldwide.

Despite these advantages, laparoscopic cholecystectomy is not without limitations. Certain situations, such as severe inflammation, dense adhesions, anatomical variations, and intraoperative complications, may necessitate conversion to open surgery [7]. Additionally, concerns regarding bile duct injury, which may be more frequent in laparoscopic procedures during the learning curve, have been highlighted in several studies [8]. Therefore, the choice between laparoscopic and open cholecystectomy may still depend on patient factors, surgeon expertise, and available infrastructure, particularly in resource-limited settings.

In the Indian context, especially in tertiary care centers catering to a diverse population, both laparoscopic and open cholecystectomy are performed. However, variations in patient profiles, disease severity, and healthcare resources necessitate context-specific evaluation of outcomes. Existing literature from Western countries may not be directly applicable to the Indian population due to differences in demographics, disease presentation, and healthcare delivery systems [9].

Furthermore, while several studies have compared laparoscopic and open cholecystectomy, there remains a need for region-specific data from North India to assess perioperative outcomes, complication rates, duration of hospital stay, and overall patient recovery. Such evidence is essential for guiding clinical decision-making, optimizing patient care, and improving surgical outcomes in local settings [10-12].

Therefore, the present study was undertaken to compare the outcomes of laparoscopic versus open cholecystectomy in patients with gallstone disease in a tertiary care hospital in North India. The primary objective was to evaluate and compare intraoperative and postoperative outcomes, including operative time, postoperative pain, complications, and duration of hospital stay between the two surgical approaches.

METHODOLOGY

Study Design: This study was designed as a hospital-based prospective comparative observational study conducted to evaluate and compare outcomes between laparoscopic and open cholecystectomy.

Study Setting: The study was conducted in the Department of General Surgery at a tertiary care teaching hospital in North India, catering to both urban and rural populations.

Study Duration: The study was carried out over a period of nine months from February 2012 to October 2012.

Study Population: The study population comprised patients diagnosed with symptomatic cholelithiasis and admitted for elective cholecystectomy during the study period.

Inclusion Criteria

- Patients aged 18–65 years
- Diagnosed cases of symptomatic gallstone disease confirmed by ultrasonography
- Patients fit for surgery under general anesthesia
- Patients providing informed written consent

Exclusion Criteria

- Patients with complicated gallstone disease (e.g., gallbladder perforation, empyema, malignancy)
- Patients with common bile duct stones requiring additional procedures
- Patients with severe cardiopulmonary comorbidities contraindicating laparoscopy
- Pregnant women
- Patients unwilling to participate

Sample Size: The sample size was calculated based on expected differences in postoperative hospital stay between laparoscopic and open cholecystectomy reported in previous studies. Assuming a moderate effect size, 95% confidence level, and 80% power, the minimum required sample size was estimated to be 40 patients in each group. To account for potential dropouts and incomplete data, 45 patients were included in each group, making a total sample size of 90 patients.

Sampling Technique: A consecutive sampling technique was used. Eligible patients admitted during the study period were allocated into two groups based on the surgical procedure performed: laparoscopic cholecystectomy group (n=45) and open cholecystectomy group (n=45). The choice of procedure depended on surgeon expertise, patient preference, and clinical indications.

Data Collection Tools & Procedure: Data were collected using a predesigned, semi-structured case record form. After obtaining informed consent, detailed history, clinical examination findings, and relevant laboratory and radiological investigations were recorded. Intraoperative details such as duration of surgery, intraoperative complications, and need for conversion (if any) were noted. Postoperative parameters including pain assessment (using Visual Analog Scale), time to ambulation, duration of hospital stay, and postoperative complications (e.g., wound infection, bile leak) were documented. Patients were followed up until discharge and during the early postoperative period.

Study Variables: The independent variable was the type of surgical procedure (laparoscopic versus open cholecystectomy). Dependent variables included operative time, intraoperative complications, postoperative pain scores, duration of hospital stay, time to return to normal activity, and postoperative complications. Socio-demographic and clinical variables such as age, sex, and comorbidities were also recorded as potential confounders.

Statistical Analysis: Data were entered into Microsoft Excel and analyzed using Statistical Package for the Social Sciences (SPSS) software version 16.0. Descriptive statistics were used to summarize the data. Continuous variables were expressed as mean $\pm$ standard deviation, while categorical variables were presented as frequencies and percentages. The independent t-test was used for comparison of continuous variables, and the chi-square test or Fisher's exact test was applied for categorical variables. A p-value of less than 0.05 was considered statistically significant.

Ethical Considerations: Written informed consent was obtained from all participants prior to inclusion in the study. Confidentiality of patient information was maintained throughout the study. The study adhered to the ethical principles outlined in the Declaration of Helsinki.

RESULTS

A total of 90 patients were included in the study, with 45 patients each in the laparoscopic and open cholecystectomy groups. The baseline demographic characteristics, including age and gender distribution, were comparable between the two groups, with no statistically significant difference (Table 1).

Table 1: Distribution of Study Participants According to Demographic Characteristics (n=90)

Variable	Laparoscopic (n=45)	Open (n=45)	p-value
Age (years, mean $\pm$ SD)	42.1 $\pm$ 10.5	44.3 $\pm$ 11.2	0.32
Gender (Male)	14 (31.1%)	16 (35.6%)	0.65
Gender (Female)	31 (68.9%)	29 (64.4%)	

The mean operative time was significantly shorter in the laparoscopic group compared to the open group. Although intraoperative complications were fewer in the laparoscopic group, the difference was not statistically significant. Conversion to open surgery was required in a small proportion of laparoscopic cases (Table 2).

Table 2: Intraoperative Findings and Outcomes

Variable	Laparoscopic (n=45)	Open (n=45)	p-value
Operative Time (minutes, mean $\pm$ SD)	75.4 $\pm$ 15.2	90.6 $\pm$ 18.5	<0.001*
Intraoperative Complications	3 (6.7%)	5 (11.1%)	0.46
Conversion to Open Surgery	2 (4.4%)	—	—

*Statistically significant

Postoperative recovery parameters showed a clear advantage for laparoscopic cholecystectomy. Patients in the laparoscopic group experienced significantly lower pain scores, earlier ambulation, and faster return to normal activities compared to the open surgery group (Table 3).

Table 3: Postoperative Pain and Recovery Parameters

Variable	Laparoscopic (n=45)	Open (n=45)	p-value
Pain Score (VAS, mean $\pm$ SD)	3.2 $\pm$ 1.1	5.8 $\pm$ 1.4	<0.001*
Time to Ambulation (hours)	14.5 $\pm$ 3.2	26.3 $\pm$ 5.1	<0.001*
Return to Normal Activity (days)	6.8 $\pm$ 1.9	11.5 $\pm$ 2.8	<0.001*

*Statistically significant

Postoperative complications were overall significantly lower in the laparoscopic group. While individual complications such as wound infection and fever were more frequent in the open group, these differences were not statistically significant. However, the overall complication rate was significantly higher in the open group (Table 4).

Table 4: Postoperative Complications

Complication	Laparoscopic (n=45)	Open (n=45)	p-value
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Wound Infection	2 (4.4%)	6 (13.3%)	0.14
Bile Leak	1 (2.2%)	1 (2.2%)	1.00
Fever	3 (6.7%)	7 (15.6%)	0.18
Overall Complications	6 (13.3%)	14 (31.1%)	0.04*

*Statistically significant

The duration of hospital stay was significantly shorter in patients undergoing laparoscopic cholecystectomy compared to those undergoing open surgery (Table 5).

Table 5: Duration of Hospital Stay

Variable	Laparoscopic (n=45)	Open (n=45)	p-value
Hospital Stay (days, mean $\pm$ SD)	2.8 $\pm$ 0.9	5.6 $\pm$ 1.4	<0.001*

*Statistically significant

DISCUSSION

The present study compared the outcomes of laparoscopic and open cholecystectomy in a tertiary care setting in North India. The key findings indicate that laparoscopic cholecystectomy is associated with significantly shorter operative time, reduced postoperative pain, earlier ambulation, faster return to normal activities, lower overall complication rates, and shorter hospital stay compared to open cholecystectomy. Baseline demographic characteristics between the two groups were comparable, ensuring that the observed differences in outcomes were attributable to the type of surgical intervention.

The demographic profile in the present study demonstrated a higher proportion of female patients in both groups, which is consistent with the well-established higher prevalence of gallstone disease among women due to hormonal and metabolic factors [1]. The mean age of patients in both groups was in the fourth decade of life, which aligns with findings from other Indian and international studies [2,10].

In this study, the mean operative time was significantly lower in the laparoscopic group compared to the open group. While earlier studies have reported longer operative times for laparoscopic procedures, especially during the initial learning phase, more recent studies have demonstrated reduced operative duration with increasing surgical expertise and advancements in technology [4,7]. The shorter operative time observed in this study may reflect improved proficiency and standardization of laparoscopic techniques in tertiary care centers.

Postoperative pain, as assessed by the Visual Analog Scale, was significantly lower in patients undergoing laparoscopic cholecystectomy. This finding is consistent with previous studies, which have attributed reduced pain to smaller incisions, minimal tissue handling, and less postoperative inflammation [6]. Consequently, patients in the laparoscopic group were able to ambulate earlier and resume normal activities sooner, highlighting the benefits of minimally invasive surgery in enhancing postoperative recovery.

The overall complication rate was significantly lower in the laparoscopic group, although individual complications such as wound infection and fever did not show statistically significant differences. The reduced incidence of complications in laparoscopic procedures may be attributed to smaller incisions, reduced exposure of internal tissues, and lower risk of wound contamination [8]. Similar findings have been reported in multiple comparative studies, reinforcing the safety profile of laparoscopic cholecystectomy [10-12].

The duration of hospital stay was significantly shorter in the laparoscopic group, which is one of the most consistent and clinically relevant advantages of this approach. Shorter hospitalization not only benefits patients in terms of reduced morbidity and faster return to normal life but also has important

implications for healthcare systems by decreasing bed occupancy and overall treatment costs [4]. This is particularly relevant in resource-constrained settings such as India.

Conversion to open surgery was required in a small proportion of laparoscopic cases in this study, which is comparable to rates reported in the literature [7]. Conversion is often necessitated by intraoperative challenges such as dense adhesions or unclear anatomy and should not be considered a complication but rather a measure to ensure patient safety.

The findings of this study have important clinical implications. The clear advantages of laparoscopic cholecystectomy in terms of recovery, complications, and hospital stay support its continued use as the preferred surgical approach for gallstone disease in tertiary care settings. However, the availability of trained surgeons and appropriate infrastructure remains crucial for optimal outcomes.

Strengths of this study include its prospective design, equal sample size in both groups, and comprehensive assessment of both intraoperative and postoperative outcomes. The study provides context-specific data from a North Indian tertiary care center, contributing to the existing body of evidence.

However, certain limitations must be acknowledged. The study was conducted in a single center, which may limit generalizability. The sample size, although adequate for comparison, was relatively small. Additionally, the allocation of patients was not randomized, which may introduce selection bias. Long-term outcomes such as quality of life and recurrence were not assessed. Future multicentric studies with larger sample sizes and randomized designs are recommended to validate these findings and further explore long-term outcomes.

CONCLUSION

The present study demonstrates that laparoscopic cholecystectomy offers significant advantages over open cholecystectomy in the management of symptomatic gallstone disease. Patients undergoing laparoscopic surgery experienced reduced postoperative pain, earlier ambulation, quicker return to normal activities, and shorter hospital stay. Additionally, the overall complication rate was lower in the laparoscopic group, reinforcing its safety and efficacy profile.

Although operative time was shorter in the laparoscopic group in this study, this finding may be influenced by surgeon expertise and institutional experience. The minimal requirement for conversion to open surgery further supports the feasibility of laparoscopic cholecystectomy in appropriately selected patients. These findings highlight the importance of adopting laparoscopic cholecystectomy as the preferred surgical modality in tertiary care settings. Efforts should be made to enhance training, improve infrastructure, and ensure wider accessibility to minimally invasive surgical techniques. Future research with larger sample sizes and multicentric designs is recommended to validate these findings and assess long-term outcomes.

DECLARATIONS

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Conflict of Interest: The authors declare no conflict of interest.

Consent: Written informed consent was obtained from all participants.

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