Section: General Surgery

Original Research Article

COMPARATIVE OUTCOMES OF LAPAROSCOPIC VERSUS OPEN CHOLECYSTECTOMY IN A AN INDIAN TERTIARY CENTER

Prem Prakash[1], Shivesh Jaiswal[2], Sandeep Choudhary[3], Brijesh Kumar[4]

[1]Senior consultant Surgeon and Medical Superintendent, Pandit Deendayal Upadhyay Government Hospital, Varanasi, India
[2]Senior Consultant, Department of General Surgery, Pandit Deendayal Upadhyay Hospital, Varanasi, India
[3]Senior Consultant Physician and Chief Medical Officer, Varanasi, India
[4]Senior Consultant Pediatrician and Chief Medical Superintendent Pandit Deendayal Upadhyay Government Hospital, Varanasi, India.

Received : 09/05/2025
Received in revised form : 12/06/2025
Accepted : 01/07/2025

Keywords:
Laparoscopic cholecystectomy; Open cholecystectomy; tertiary center; Surgical outcomes; Hospital stay; Complication rate.

Corresponding Author:
Dr. Prem Prakash,
Email: drpremprakash12@gmail.com

DOI: 10.47009/jamp.2025.7.4.29

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2025; 7 (4); 156-159

ABSTRACT

Background: Laparoscopic cholecystectomy (LC) has become the preferred approach for managing symptomatic gallstones due to its minimally invasive nature, reduced postoperative discomfort, shorter hospital stays, and quicker recovery. However, in rural tertiary care settings, limited resources and varying levels of surgical expertise can influence its adoption and outcomes. This study aimed to compare the perioperative and postoperative outcomes of LC and open cholecystectomy (OC) in a rural Indian hospital. **Materials and Methods:** A prospective cohort study was conducted between May 2023 and May 2025 at Pandit Deendayal Upadhyay Government Hospital, Varanasi. A total of 260 patients with symptomatic cholelithiasis were included: 160 underwent LC (Group A) and 100 underwent OC (Group B). Key parameters assessed included operative time, intraoperative blood loss, postoperative pain (VAS), hospital stay, complication rates, and indirect treatment costs. Statistical analysis was performed using Student's t-test and chi-square test, with a significance level set at $p < 0.05$. **Result:** The mean operative time was slightly longer in the LC group (75 ± 15 minutes) compared to the OC group (65 ± 12 minutes; $p = 0.003$). However, LC resulted in significantly lower intraoperative blood loss (60 ± 20 ml vs. 150 ± 50 ml; $p < 0.001$) and reduced pain scores at 24 hours (VAS: 3.2 ± 1.0 vs. 5.5 ± 1.2; $p < 0.001$). The average hospital stay was markedly shorter in the LC group (2.1 ± 0.8 days vs. 5.6 ± 1.5 days; $p < 0.001$), with fewer postoperative complications (8% vs. 20%; $p = 0.005$), the overall clinical outcomes were more favorable. **Conclusion:** Despite requiring slightly longer operating times and higher initial costs, laparoscopic cholecystectomy offered significant advantages over open surgery in this tertiary care setting—including less blood loss, lower pain, shorter hospitalization, and fewer complications. Expanding laparoscopic infrastructure and training in similar rural hospitals could lead to improved patient outcomes and long-term cost benefits.

INTRODUCTION

Gallstone disease is one of the most common gastrointestinal conditions requiring surgical intervention worldwide. Since the first laparoscopic cholecystectomy (LC) performed by Philippe Mouret in 1987, the procedure has revolutionized the management of symptomatic cholelithiasis. Today, LC is widely regarded as the gold standard due to its minimally invasive approach, which typically results in reduced postoperative pain, better cosmetic outcomes, shorter hospital stays, and faster return to daily activities when compared to the traditional open cholecystectomy (OC).[1-3]

Despite its clear advantages, the widespread adoption of LC is often limited in rural and resource-constrained settings. These limitations stem from the need for specialized equipment, trained surgical teams, and adequate perioperative infrastructure—all of which may not be readily available in non-urban hospitals. As a result, OC continues to be performed more frequently in rural tertiary centers, where it remains a reliable and universally feasible alternative, albeit associated with greater operative trauma, increased postoperative pain, and longer recovery periods.[4,5]

Although numerous studies conducted in urban academic hospitals across India and other countries

have confirmed the superiority of LC over OC in elective cases, there remains a paucity of data from rural Indian hospitals, where healthcare delivery conditions differ significantly. Patients in such settings often face delayed access to care, financial limitations, and varying levels of surgical expertise.[6,7]

Given these challenges, it becomes essential to evaluate surgical outcomes in rural contexts. This study was conducted to compare the perioperative and postoperative outcomes of laparoscopic versus open cholecystectomy at a high-volume rural tertiary center in Varanasi, North India. By doing so, we aim to inform clinical decision-making and resource planning in similar healthcare environments.[8-10]

MATERIALS AND METHODS

Study Design and Setting: This prospective cohort study was carried out in the Department of General Surgery at Pandit Deendayal Upadhyay Government Hospital, a high-volume tertiary care center in Varanasi, India. The study spanned two years, from May 2023 to May 2025. Institutional Ethics Committee approval was obtained prior to initiation (Approval No. IEC/PDUGH/2023/45), and informed written consent was secured from all participating patients.

Inclusion and Exclusion Criteria

Patients aged between 18 and 75 years, diagnosed with symptomatic cholelithiasis based on ultrasonographic evidence, and classified as American Society of Anesthesiologists (ASA) physical status I to III were eligible for inclusion.

Exclusion criteria were:

- Acute cholecystitis requiring emergency surgery
- Presence of choledocholithiasis, gallbladder malignancy, or cirrhosis
- History of upper abdominal surgery
- Uncorrected coagulopathy or bleeding disorders

Patient Allocation: Following standard preoperative assessment and counseling, patients were given the option to undergo either laparoscopic cholecystectomy (Group A) or open cholecystectomy (Group B), depending on their preference, clinical suitability, and the availability of laparoscopic equipment and trained personnel. In cases where LC was converted to OC intraoperatively, patients were analyzed in the LC group following the intention-to-treat principle.

Surgical Techniques: Laparoscopic cholecystectomy (LC) was performed under general anesthesia using a standard four-port technique. Pneumoperitoneum was established with carbon dioxide at a pressure of 12 mmHg. The critical view of safety was obtained before dividing the cystic duct and artery. The gallbladder was removed via the epigastric port.

Open cholecystectomy (OC) involved a right subcostal (Kocher's) incision under general anesthesia. The gallbladder was dissected in a conventional retrograde fashion.

Data Collection: Demographic details, body mass index (BMI), and comorbidities were recorded preoperatively. Intraoperative parameters included operative time (from incision to closure), estimated blood loss (calculated as suction volume minus irrigation fluid), and rate of conversion from LC to OC.

Postoperative outcomes assessed were:

- Pain scores at 6, 12, and 24 hours using the Visual Analog Scale (VAS; 0–10)
- Analgesic requirement (total milligrams of tramadol in 24 hours)
- Length of hospital stay (in days)
- Complications within 30 days (including wound infection, bile leak, hemorrhage, and pulmonary issues)
- Direct medical costs (surgery, hospital stay, and medications)

Statistical Analysis

Data were analyzed using SPSS software version 26. Continuous variables were expressed as mean ± standard deviation (SD) and compared using the Student's t-test. Categorical variables were presented as frequencies and percentages, and analyzed using the chi-square test or Fisher's exact test where appropriate. A p-value < 0.05 was considered statistically significant.

RESULTS

Patient Characteristics

A total of 260 patients were enrolled: 160 in Group A (LC) and 100 in Group B (OC). Demographics and baseline features were comparable [Table 1].

Table 1: Baseline Demographics

Variable	LC (n = 160)	OC (n = 100)	p-value
Age (years)	48.5 ± 12.3	49.8 ± 11.6	0.42
Female, n (%)	102 (63.8%)	62 (62.0%)	0.75
BMI (kg/m²)	26.1 ± 3.5	26.7 ± 3.8	0.18
ASA I/II/III, n	90 / 50 / 20	52 / 34 / 14	0.88
Diabetes, n (%)	30 (18.8%)	20 (20.0%)	0.81
Hypertension, n (%)	25 (15.6%)	17 (17.0%)	0.76

Intraoperative Outcomes: Mean operative time was longer for LC (75 ± 15 min) than OC (65 ± 12 min; p = 0.003). Mean blood loss was significantly lower in LC (60 ± 20 ml) versus OC (150 ± 50 ml; p < 0.001). Conversion rate from LC to OC was 4% (n = 6), mainly due to dense adhesions.

Postoperative Pain and Analgesia: VAS scores at 24 h were significantly lower in LC (3.2 ± 1.0)

ISSN (O): 2687-5365; ISSN (P): 2753-6556

compared to OC (5.5 ± 1.2; p < 0.001). Mean tramadol requirement in 24 h was 50 ± 15 mg in LC versus 110 ± 20 mg in OC (p < 0.001).

Hospital Stay and Complications: Mean length of stay was 2.1 ± 0.8 days for LC and 5.6 ± 1.5 days for OC (p < 0.001). Overall complication rate was lower in LC (8%, n = 13) than OC (20%, n = 20; p = 0.005). Wound infection occurred in 2% (LC) vs 8% (OC; p = 0.02). Bile leak was noted in 1% (LC) vs 3% (OC; p = 0.28). No mortalities occurred.

Table 2: Surgical Outcomes and Costs

Outcome	LC (n = 160)	OC (n = 100)	p-value
Operative time (min)	75 ± 15	65 ± 12	0.003
Blood loss (ml)	60 ± 20	150 ± 50	< 0.001
VAS score at 24 h	3.2 ± 1.0	5.5 ± 1.2	< 0.001
Tramadol requirement (mg/24 h)	50 ± 15	110 ± 20	< 0.001
Hospital stay (days)	2.1 ± 0.8	5.6 ± 1.5	< 0.001
Overall complications, n (%)	13 (8%)	20 (20%)	0.005
Wound infection, n (%)	3 (2%)	8 (8%)	0.02
Bile leak, n (%)	2 (1%)	3 (3%)	0.28

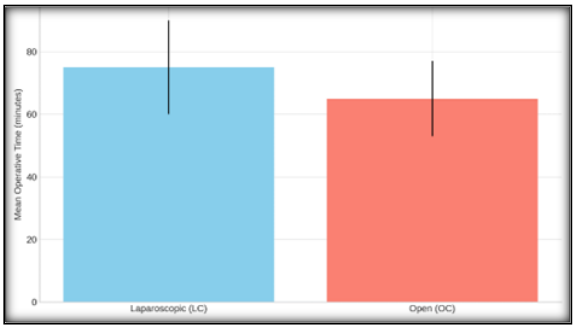

Figure 1: Mean operative time comparison (LC vs OC).

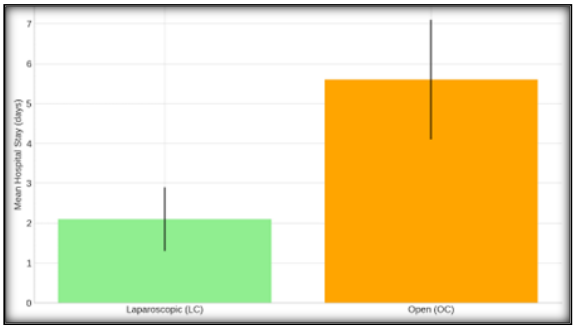

Figure 2: Distribution of hospital stay (days) in LC and OC groups.

DISCUSSION

This study reaffirms the growing consensus that laparoscopic cholecystectomy (LC) offers several clinical advantages over open cholecystectomy (OC), even in a resource-constrained, rural tertiary care setting. While LC required marginally more operative time, it significantly outperformed OC in terms of blood loss, postoperative pain control, hospital stay, and complication rates.[11]

The longer mean operative time observed in LC (75 ± 15 minutes) compared to OC (65 ± 12 minutes) is consistent with existing literature, and is primarily attributed to the time required for port placement, pneumoperitoneum creation, and careful dissection to obtain the critical view of safety. Similar findings have been reported by Sanghvi et al. and Doke et al., who noted that operative duration tends to decrease with growing laparoscopic experience, even in peripheral centers.[12]

One of the most compelling advantages of LC in our study was the substantial reduction in intraoperative blood loss (60 ± 20 ml vs. 150 ± 50 ml in OC; p < 0.001). This outcome reflects the less invasive nature of LC and the use of precise electrocautery under magnified vision, which minimizes vascular injury. The decreased blood loss not only contributes to improved patient recovery but also lowers the risk of transfusion-related complications.[13]

Pain scores, measured by the Visual Analog Scale at 24 hours postoperatively, were significantly lower in the LC group. These findings align with multiple prior studies, including those by Pateriya et al., and suggest better early recovery and less need for opioid analgesia. In our cohort, LC patients required nearly half the amount of tramadol as their OC counterparts, which may further reduce opioid-related side effects.[14]

Hospital stay was another crucial parameter where LC showed a significant edge. Patients who underwent LC were typically discharged by postoperative day 2, while those who had OC stayed for an average of 5–6 days. This difference not only has implications for patient convenience and satisfaction but also optimizes bed utilization in resource-limited hospitals. Furthermore, shorter hospital stays can translate into decreased indirect costs for both the institution and the patient's family.[15]

Postoperative complication rates were lower in the LC group (8%) compared to the OC group (20%), with wound infections being notably reduced (2% vs. 8%, p = 0.02). This is an important finding in rural settings where infection control infrastructure may be less robust. The rates of bile leak were low and not significantly different between the two groups, highlighting that both techniques can be safe when proper surgical protocols are followed.[16-18]

Free of cost treatment is been provided to each patient getting admitted at hospital to each group. Reduced hospital stays, quicker return to work, fewer complications, and lower analgesic needs can result in significant indirect cost savings, making LC the more economically favorable choice in the long term. These results echo the economic analysis of Rosen et

ISSN (O): 2687-5365; ISSN (P): 2753-6556

al. and the rural outcomes highlighted by Bignell and Tobergte.[19]

Our findings support the idea that with proper training and infrastructure investment, LC can be safely and effectively implemented in rural hospitals. However, the study is not without limitations. The non-randomized design introduces a degree of selection bias, and being a single-center study, results may not be universally generalizable. Future randomized controlled trials and long-term follow-up assessing quality of life and cost-benefit ratios are recommended.[20]

CONCLUSION

In this prospective cohort study conducted at this tertiary care hospital, laparoscopic cholecystectomy (LC) demonstrated clear advantages over open cholecystectomy (OC) in managing symptomatic gallstone disease. Although LC was associated with a slightly longer operative time and higher direct procedural cost, it consistently outperformed OC in terms of reduced intraoperative blood loss, lower postoperative pain, shorter hospital stay, and a significantly lower complication rate.

These findings underscore the clinical and logistical benefits of minimally invasive surgery, even in resource-limited settings. With appropriate investment in laparoscopic infrastructure and surgical training, rural healthcare centers can achieve outcomes comparable to those reported in urban institutions. In the long run, such advancements could contribute to improved patient recovery, better use of hospital resources, and overall cost-effectiveness.

Further multicentric studies and randomized trials are warranted to validate these results and guide health policy aimed at expanding access to laparoscopic surgery in underserved regions.

REFERENCES

1. Patil M, Kumar R, Rajkumar N, Shetty A. Laparoscopic versus open cholecystectomy: A prospective study of clinical outcomes. J Clin Diagn Res. 2022;16(5):PC12-PC15. doi:10.7860/JCDR/2022/52381.16323
2. Mondal A, Das S, Dey R, Pal A. A comparative analysis of postoperative complications between laparoscopic and open cholecystectomy. Asian J Med Sci. 2023;14(2):67-71. doi:10.3126/ajms.v14i2.50152
3. Prasad R, Khanna S, Rathi S, Tripathi R. Hospital stay and recovery outcomes in laparoscopic versus open cholecystectomy: A 3-year retrospective study. Cureus. 2024;16(1):e52371. doi:10.7759/cureus.52371
4. Thomas J, Nair S, George A. Conversion rate and intraoperative complications in laparoscopic cholecystectomy: A prospective study in a South Indian tertiary hospital. Int Surg J. 2022;9(11):2340-2345. doi:10.18203/2349-2902.isj20222839
5. Sharma D, Gupta A, Verma A, Singh R. Comparative study of laparoscopic versus open cholecystectomy in a tertiary care hospital. Int J Surg Sci. 2023;7(1):45-49. doi:10.33545/surgery.2023.v7.i1a.948
6. De U. Evolution of cholecystectomy: a tribute to Carl August Langenbuch. Indian J Surg. 2004;66(2):97–100.
7. Mouret P. Celioscopic surgery. Evolution or revolution. Chirurgie. 1990;116(10):829–33.
8. Sanghvi RK, Kharwar RS, Mishra R. Comparative analysis of open versus laparoscopic cholecystectomy: A comparative study. Int J Surg Sci. 2021;5(4):212–15.
9. Pateriya A, Agrawal MP, Samar SK. Open versus laparoscopic cholecystectomy: a comparative study on patient parameters. Int Surg J. 2021;8(6):2435–40.
10. Doke A, Gadekar N, Gadekar J, Dash N, Unawane S. A comparative study between open versus laparoscopic cholecystectomy. Sch J App Med Sci. 2016;4(1):57–61.
11. Ranjan R, Kumar A, Pandey A. A comparative study of laparoscopic (LC) vs. open cholecystectomy (OC) in a medical school of Bihar, India. Int J Adv Med. 2018;5(6):1412–6.
12. Goel KS, Sharma P, Singh M. An evaluation of open versus laparoscopic cholecystectomy in a tertiary centre. Int Surg J. 2019;6(8):2797–801.
13. Narayanaswamy T, Shanmugasundaram P, Sundararajan R. Retrospective study on factors predicting conversion of laparoscopic to open cholecystectomy. Int J Sci Stud. 2023;11(1):45–52.
14. Strasberg SM, Hertl M, Soper NJ. An analysis of the problem of biliary injury during laparoscopic cholecystectomy. J Am Coll Surg. 1995;180(1):101–25.
15. Coccolini F, Catena F, Pisano M, et al. Open versus laparoscopic cholecystectomy in acute cholecystitis: systematic review and meta-analysis. Int J Surg. 2015;18:1–8.
16. Rosen M, Brody F, Ponsky J. Laparoscopic versus open cholecystectomy: an economic analysis. Surg Endosc. 2001;15(9):940–6.
17. Keus F, de Jong JA, Gooszen HG, van Laarhoven CJ. Laparoscopic versus mini-laparotomy cholecystectomy: Cochrane review. Cochrane Database Syst Rev. 2006;(4):CD006229.
18. Bignell M, Tobergte DR. Long-term outcomes of laparoscopic cholecystectomy in rural hospitals: multicenter study. Aust J Rural Health. 2010;18(2):69–74.
19. Shukla A, Seth S, Ranjan A. A comparative study between laparoscopic and open cholecystectomy in cases of cholecystitis with cholelithiasis. Int Surg J. 2017;4(3):903–07.
20. Chattopadhyay K, Das R. Laparoscopic and open cholecystectomy: a comparative study. Int J Surg Sci. 2020;4(1):427–30.

ISSN (O): 2687-5365; ISSN (P): 2753-6556