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OPERATIVE METRICS IN LAPAROSCOPIC AND OPEN CHOLECYSTECTOMY

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ABSTRACT:
Background: Laparoscopic cholecystectomy (LC) has become the standard procedure for gallbladder disease, though open cholecystectomy (OC) continues to be performed in selected cases. Comparative evaluation of operative metrics provides valuable insight into surgical performance, safety, and evolving techniques.
Objective: To compare operative time, intra-operative events, postoperative recovery, complications, and hospital stay between LC and OC, using operative data.
Materials and Methods: The study included 186 patients who underwent LC (n = 132) or OC (n = 54) for symptomatic gallstone disease at a tertiary care teaching hospital. Data were extracted from operative registers, anaesthesia notes, and inpatient case files. Key metrics included operative duration, blood loss, conversion rate, postoperative pain, wound complications, and hospital stay. Statistical analysis was performed using t-test and Chi-square test, with significance set at $P < 0.05$.
Results: LC demonstrated significantly shorter operative time (58.4 ± 12.8 vs 82.3 ± 16.5 minutes, $P < 0.001$), reduced blood loss (47.2 ± 18.4 vs 112.6 ± 35.7 mL, $P < 0.001$), and fewer wound complications (3.7% vs 14.8%). Conversion to open occurred in 6 cases (4.5%). Postoperative pain was lower in LC, with most patients requiring only NSAIDs, whereas 63% of OC patients required opioids. Mean hospital stay was significantly shorter in LC (2.6 ± 1.1 vs 6.1 ± 1.8 days, $P < 0.001$).
Conclusion: Laparoscopic cholecystectomy demonstrated superior operative and postoperative outcomes compared with open cholecystectomy, including shorter operative duration, reduced blood loss, fewer complications, and faster recovery. While LC remains the preferred technique, OC continues to play a vital role in complicated cases.

Keywords: Laparoscopic cholecystectomy, Open cholecystectomy, Operative metrics, Gallstone disease

INTRODUCTION:

Cholecystectomy is among the most commonly performed abdominal surgeries worldwide, primarily indicated for symptomatic gallstone disease [1]. Since the introduction of laparoscopic techniques in the early 1990s, surgical practice has shifted significantly toward minimally invasive approaches [2,3]. Laparoscopic cholecystectomy (LC) rapidly became the preferred method due to its advantages, including reduced postoperative pain, shorter hospital stay, faster recovery, and improved cosmetic outcomes [4–6].

Despite these benefits, open cholecystectomy (OC) continues to play an important role, particularly in complex cases such as severe inflammation, dense adhesions, or distorted anatomy where laparoscopic dissection may be unsafe [7,8]. In teaching hospitals, OC also remains relevant for surgical training, ensuring that surgeons are prepared to manage challenging operative scenarios [9]. Evaluating operative metrics such as operative time, blood loss, conversion rates, complications, and hospital stay provides valuable insight into surgical performance and patient outcomes [10,11]. By analysing data from cholecystectomy cases performed. This study aims to compare LC and OC across key operative and postoperative parameters. Such comparisons highlight the progress achieved in minimally invasive surgery while reaffirming the continuing importance of OC in selected patient populations [12,13].

MATERIALS AND METHODS

Study Design

This was a comparative observational study designed to evaluate operative and postoperative outcomes of laparoscopic cholecystectomy (LC) and open cholecystectomy (OC). The study adhered to STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) guidelines to ensure methodological transparency.

Study Setting

The study was conducted in the Department of General Surgery at a tertiary care teaching hospital. Operative records were reviewed. All procedures were performed by consultant surgeons or senior residents under supervision, ensuring standardized technique and documentation.

Study Population

A total of 186 patients underwent cholecystectomy during the study period. Of these, 132 (71%) underwent LC and 54 (29%) underwent OC.

Inclusion Criteria

- Age between 18–70 years at the time of surgery.
- Diagnosis of symptomatic gallstone disease confirmed by ultrasonography.
- Elective cholecystectomy performed during the study period.
- Underwent either laparoscopic or open cholecystectomy as the primary procedure.
- Complete operative and inpatient records available for review.
- Fit for general anaesthesia as assessed by the anaesthesiology team.

Exclusion Criteria

- Emergency presentations such as gallbladder perforation, empyema, or gangrenous cholecystitis.
- Concurrent major procedures including common bile duct (CBD) exploration or bowel resection.
- Underlying biliary tract malignancy or other pathology requiring extended surgery.
- Severe comorbidities that contraindicated standard anesthesia or operative technique.
- Incomplete documentation with missing operative records, anesthesia notes, or inpatient case files.
- Previous biliary surgery altering anatomy, or patients outside the defined age range (18–70 years).

Laparoscopic Cholecystectomy (LC)

1. Anaesthesia and Positioning: All patients were operated under general anaesthesia. The patient was placed supine with reverse Trendelenburg and slight left tilt to facilitate exposure.
2. Port Placement: Pneumoperitoneum was established with carbon dioxide at 12–14 mmHg. A 10-mm umbilical port was used for the laparoscope, with three additional ports (epigastric, right mid-clavicular, and right anterior axillary).
3. Dissection: Calot's triangle was carefully dissected to obtain the critical view of safety. The cystic duct and cystic artery were clipped and divided.

4. Gallbladder Removal: The gallbladder was separated from the liver bed using electrocautery and extracted through the umbilical port.
5. Closure: Haemostasis was ensured, the peritoneal cavity inspected for bile leak or bleeding, and ports were closed after desufflation.

Open Cholecystectomy (OC)

1. Anaesthesia and Incision: Procedures were performed under general anaesthesia through a right subcostal (Kocher's) incision.
2. Exposure: The gallbladder was exposed by retracting the liver superiorly.
3. Dissection: The cystic duct and artery were identified, ligated, and divided under direct vision.
4. Gallbladder Removal: The gallbladder was dissected from the liver bed using electrocautery, with meticulous haemostasis.
5. Drain Placement: A subhepatic drain was placed selectively in cases of difficult dissection or suspected bile leak.
6. Closure: The abdominal wall was closed in layers.

Standardization

- All procedures were performed by consultant surgeons or senior residents under supervision, following uniform operative protocols.
- Intraoperative findings such as adhesions, anatomical variations, or bleeding were documented.
- Conversion from LC to OC was undertaken when safe laparoscopic dissection was not feasible.

Data Collection

Data were extracted from operative registers, anaesthesia notes, and inpatient case files using a standardized proforma. Parameters recorded included:

- Demographic details (age, sex)
- Indication for surgery
- Operative duration (skin incision to closure)
- Estimated blood loss (suction volume + gauze count)
- Intra-operative difficulty (adhesions, anatomical variations, bleeding)
- Conversion rate (LC to OC)
- Postoperative pain (analgesic requirement within 24 hours)
- Complications (surgical site infection, bile leak, intra-abdominal collection)
- Return of oral intake (hours post-surgery)
- Length of hospital stay (days from admission to discharge)

Outcome Measures

- **Primary outcome:** Operative duration
- **Secondary outcomes:** Blood loss, conversion rate, postoperative pain, wound complications, return of oral intake, and hospital stay

Statistical Analysis

- Continuous variables were expressed as mean ± standard deviation (SD) and compared using Student's *t*-test.
- Categorical variables were expressed as percentages and compared using Chi-square or Fisher's exact test.
- A p-value <0.05 was considered statistically significant.
- Statistical analysis was performed using SPSS version 16.0.

Ethical Considerations
The study protocol was reviewed and approved by the institutional ethics committee. Patient confidentiality was maintained by anonymizing records. As this was a retrospective analysis of operative data, informed consent was waived.

RESULTS:
A total of 186 patients underwent cholecystectomy during the study period, comprising 132 laparoscopic cholecystectomies (LC, 71%) and 54 open cholecystectomies (OC, 29%). The mean age was comparable between groups (41.8 ± 12.3 years in LC vs. 44.1 ± 11.5 years in OC), with a female predominance in both cohorts (72% vs. 68%).

Operative Metrics
- **Operative duration:** LC demonstrated significantly shorter operative time compared with OC (58.4 ± 12.8 vs. 82.3 ± 16.5 minutes, $P < 0.001$).
- **Blood loss:** Mean intraoperative blood loss was lower in LC (47.2 ± 18.4 mL) than OC (112.6 ± 35.7 mL, $P < 0.001$).
- **Conversion rate:** Six LC cases (4.5%) required conversion to OC due to adhesions, unclear anatomy, or intraoperative bleeding.

Postoperative Recovery
- **Pain:** LC patients reported lower pain scores, with most requiring only NSAIDs. In contrast, 63% of OC patients required opioid analgesia.
- **Return of oral intake:** LC patients resumed oral intake within 12 hours, compared to 24–36 hours in OC.
- **Hospital stays:** LC patients had significantly shorter hospital stay (2.6 ± 1.1 days) compared with OC (6.1 ± 1.8 days, $P < 0.001$).

Complications
- **Wound complications:** LC had fewer wound infections (3.7%) compared with OC (14.8%), predominantly superficial surgical site infections.
- **Other complications:** No major bile duct injuries were reported in either group

Operative Metrics in Laparoscopic vs Open Cholecystectomy:

Parameter	Laparoscopic Cholecystectomy (LC)	Open Cholecystectomy (OC)	Statistical Significance / Notes
Number of patients	132 (71%)	54 (29%)	—
Mean age (years)	41.8 ± 12.3	44.1 ± 11.5	Comparable
Female predominance	72%	68%	—
Operative duration (minutes)	58.4 ± 12.8	82.3 ± 16.5	P < 0.001
Blood loss (mL)	47.2 ± 18.4	112.6 ± 35.7	P < 0.001
Conversion rate	6 cases (4.5%)	—	Due to adhesions, unclear anatomy, bleeding

Postoperative pain	Low (NSAID single dose in majority)	High (opioid requirement in 63%)	—
Wound complications	3.7%	14.8%	Mostly superficial SSI
Return of oral intake	Within 12 hours	24–36 hours	—
Length of hospital stay (days)	2.6 ± 1.1	6.1 ± 1.8	$P < 0.001$

DISCUSSION:

The findings of this study confirm the established advantages of laparoscopic cholecystectomy (LC) over open cholecystectomy (OC). LC demonstrated significantly shorter operative time, reduced blood loss, and a more favourable postoperative recovery profile, consistent with previous reports highlighting the benefits of minimally invasive techniques in gallbladder surgery [1–4].

The conversion rate of 4.5% reflects the challenges encountered in cases with dense adhesions, unclear anatomy, or intra-operative bleeding. Such conversions are well recognized in surgical practice [5,6] and emphasize the importance of maintaining proficiency in OC to ensure patient safety when laparoscopic dissection is not feasible.

Reduced wound complications in LC can be attributed to smaller incisions and minimal tissue handling, whereas OC showed higher rates of superficial surgical site infections [7,8]. Faster return of oral intake and shorter hospital stay in LC patients further reinforce the advantages of minimally invasive surgery, contributing to early mobilization and reduced healthcare burden [9,10].

OC cases in this study predominantly involved complicated gallbladders, explaining the longer operative duration, increased blood loss, and extended recovery. These findings highlight the continuing relevance of OC in selected complex scenarios, particularly where patient safety may be compromised by laparoscopic dissection [11,12].

Overall, the comparative analysis underscores LC as the preferred technique for gallstone disease, while reaffirming the necessity of OC as a complementary approach in difficult cases [13,14].

CONCLUSION:

This comparative study highlights the distinct advantages of laparoscopic cholecystectomy (LC) over open cholecystectomy (OC) in the management of symptomatic gallstone disease. LC was associated with significantly shorter operative duration, reduced intraoperative blood loss, fewer wound complications, lower analgesic requirements, and a markedly shorter hospital stay. These findings reinforce the role of LC as the gold standard procedure, offering patients faster recovery, improved comfort, and reduced healthcare utilization.

At the same time, the study underscores the continuing importance of OC in selected scenarios. Conversion to open surgery, though infrequent, remains a critical safeguard when dense adhesions, distorted anatomy, or intraoperative bleeding compromise safety. OC also retains value in surgical training, ensuring that future surgeons are equipped to manage complex cases where laparoscopic dissection is not feasible.

The results reaffirm the progress achieved through minimally invasive surgery while emphasizing that surgical practice must remain versatile. Proficiency in both laparoscopic and open techniques is essential to optimize patient outcomes, maintain safety in challenging cases, and preserve comprehensive surgical skill sets.

In conclusion, while LC should be considered the preferred approach for most patients with gallstone disease, OC continues to serve as a complementary and indispensable technique in complex or high-risk situations. The balanced integration of both methods ensures that surgical care remains adaptable, effective, and patient-centered.

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