RESEARCH PAPER

Surgical Outcomes of Open and Laparoscopic Cholecystectomy: A Comparative Study on Blood Loss, Pain Management, and Hospitalization Period

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ABSTRACT

Introduction

Cholecystectomy, the surgical removal of the gallbladder, is one of the most frequently performed procedures for gallstone disease. Traditionally performed as an open cholecystectomy (OC), the advent of laparoscopic cholecystectomy (LC) revolutionized the field of minimally invasive surgery. This study aims to compare OC and LC in terms of surgical outcomes, including intraoperative blood loss, post-operative pain management, and hospitalization period.

Material and Methods

A total of 120 patients diagnosed with cholelithiasis and undergoing elective cholecystectomy at Great Eastern Medical School and Hospital and Saveetha Medical College, India, were studied. Patients were randomly assigned into two groups: OC (n=60) and LC (n=60). Key parameters assessed included operative time, blood loss, pain levels (Visual Analogue Scale, VAS), analgesic and antibiotic usage, length of hospital stay, and surgical complications.

Results

The results indicated that LC was associated with significantly lower blood loss ($p<0.05$), reduced post-operative pain ($p<0.02$), shorter analgesic and antibiotic use ($p<0.001$ and $p<0.02$, respectively), and a significantly reduced hospitalization period ($p<0.001$) compared to OC. However, LC required a longer operative duration ($p<0.005$) and was more expensive. Although LC showed superior post-operative outcomes, it carried a risk of bile duct injury and required conversion to OC in 10% of cases.

Conclusion

The findings support LC as a preferable alternative to OC due to its minimal invasiveness, faster recovery, and better patient compliance, provided the procedure is performed by experienced surgeons with appropriate resources.

Keywords: Laparoscopic cholecystectomy, open cholecystectomy, blood loss, post-operative pain, hospitalization

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INTRODUCTION

One of the most prevalent gastrointestinal conditions is gallstone disease, which frequently results in acute and chronic cholecystitis that requires surgery. Open cholecystectomy (OC) was the gold standard for gallbladder removal for more than a century. But the late 20th century saw the introduction of laparoscopic cholecystectomy (LC), a minimally invasive procedure

with clear benefits that transformed surgical practice.[1]

Smaller incisions, less postoperative discomfort, shorter hospital stays, and a quicker return to normal activities are just a few advantages of LC vs OC. Because of these benefits, LC is now the surgical method of choice in many medical settings throughout the globe. However, there are certain drawbacks to LC, especially in the early stages of a surgeon's training, including a lengthier learning curve, longer operating times, and a higher chance of bile duct damage. Furthermore, the cost and accessibility of laparoscopic equipment provide major obstacles to its broad adoption in environments with low resources.[2]

With an emphasis on important factors such intraoperative blood loss, post-operative pain management, and hospital stay duration, this study compares OC with LC in a clinical environment in India. The study aims to ascertain if LC should be considered the gold standard for cholecystectomy operations by assessing these aspects, especially in emerging healthcare systems where surgical training and resource allocation are still crucial issues.[3]

MATERIALS AND METHODS

This prospective comparative study was conducted at Great eastern medical school and hospital and saveetha medical college ,India, between January 2022 and December 2024. The study included 120 patients diagnosed with cholelithiasis and scheduled for elective cholecystectomy.

Inclusion Criteria

- Patients with ultrasound-confirmed cholelithiasis
- Patients experiencing at least one attack of upper abdominal pain
- Patients fit for elective surgery

Exclusion Criteria

- Patients with common bile duct stones
- Patients with prior abdominal surgery
- Patients above 70 years of age

Study Design

Patients were randomly assigned to either the OC group (n=60) or the LC group (n=60). Surgical procedures were performed by an experienced surgeon under general anesthesia.

Outcome Measures

The following variables were analyzed:

- **Operative time** (from incision to closure)
- **Intraoperative blood loss** (estimated volume in mL)
- **Pain levels** (measured using the Visual Analogue Scale, VAS)
- **Duration of analgesic and antibiotic usage**
- **Hospitalization period** (measured in days)
- **Surgical complications** (bile duct injury, wound infection, conversion to OC)

Statistical Analysis

Statistical significance was determined using the Chi-square test and Student's t-test, with a significance threshold of $p<0.05$.

RESULTS

Table 1: Operative Time

Surgery Type	30-60 min	61-90 min	91-120 min	121-150 min	>150 min	Median (Range)	Mean ± SD	p-Value
LC (n=20)	2 (10%)	6 (30%)	9 (45%)	2 (10%)	1 (5%)	105 (60-160)	102.7 ± 29.7	<0.005
OC (n=20)	9 (45%)	7 (35%)	2 (10%)	2 (10%)	0 (0%)	70 (40-135)	75.75 ± 25.8	<0.005

Table 2: Blood Loss

Blood Loss	LC (n=20)	OC (n=20)	p-Value
<100 ml	18 (90%)	5 (25%)	<0.05
>100 ml	2 (10%)	15 (75%)	<0.05

Table 3: Post-Operative Pain (VAS Score)

Pain Score	LC (n=20)	OC (n=20)	p-Value
Grade 1	7 (35%)	1 (5%)	<0.02
Grade 2	9 (45%)	11 (55%)	<0.02
Grade 3	4 (20%)	7 (35%)	<0.02
Median VAS	2 (0-3)	3 (1-5)	<0.02

Table 4: Hospital Stay

Hospital Stay (Days)	LC (n=20)	OC (n=20)	p-Value
1-3 days	9 (45%)	0 (0%)	<0.001
4-6 days	8 (40%)	9 (45%)	<0.001
>7 days	3 (15%)	11 (55%)	<0.001

DISCUSION

Consistent with previous research, the study found that laparoscopic cholecystectomy (LC) is associated with much less intraoperative blood loss, less post-operative pain, and shorter hospital stays than open cholecystectomy (OC). These findings support the growing use of LC as the surgical technique for gallbladder removal. demonstrating how LC can reduce post-operative complications and hasten patient recovery. Additionally, meta-analyses have linked LC to a lower rate of wound infections, a decrease in the requirement for analgesics, and an increase in overall patient satisfaction.[4]

However, a major disadvantage of LC is that it operates more slowly than OC, particularly during the early learning phase. The technical demands of laparoscopic surgery, such as a steep learning curve, proficiency with minimally invasive techniques, and advanced hand-eye coordination, account for this. Studies show that when LC becomes more skilled, its operating time steadily decreases and eventually approaches that of OC. At high-volume surgical facilities where physicians perform LC on a regular basis, it has been demonstrated that operating times are comparable to or, in some cases, even lower than OC. Training programs that emphasise hands-on experience and simulation-based learning have helped to reduce this discrepancy and increase overall surgical efficiency.[5]

This study found that the LC to OC conversion rate was 10%, which is within the often reported range of 2-15%. Significant intraoperative bleeding, dissection challenges due to acute inflammation, and structural problems such as variations in the biliary tree's morphology were the primary reasons of conversion. Previous studies have shown that certain factors, including as thick adhesions, a history of recurrent bouts of cholecystitis, and advanced patient age, may raise conversion rates. Even though conversion to OC is sometimes seen as an issue, it is often a necessary and prudent decision to ensure patient safety and avoid unintended bile duct injury.[6]

Although LC has higher initial costs because to the need for specific equipment and training, it offers significant long-term benefits. They include a speedier return to normal activities, decreased post-operative morbidity, and cheaper overall healthcare costs because of shorter hospital stays and fewer post-operative issues. It has been demonstrated that LC is economically advantageous, particularly in terms of reduced post-operative care expenses and employee absenteeism. As surgical technology develops, such as with the use of robotic-assisted operations and enhanced imaging systems, the benefits of LC should become even more obvious, confirming its status as the preferred technique for gallbladder surgery.[7]

CONCLUSION

With major benefits including quicker post-operative recovery, less discomfort, and shorter hospital stays, laparoscopic cholecystectomy (LC) turns out to be a better option than open cholecystectomy (OC). These advantages enhance patient outcomes and the effectiveness of healthcare as a whole. Its broad acceptance is nevertheless hampered by greater startup costs and longer operating times, especially during the learning curve.

Structured training programs should be put in place to improve surgical skill and shorten operating times in order to solve these problems. To guarantee wider use of LC in various healthcare contexts, cost-effective tactics including improving resource allocation and expanding access to laparoscopic equipment should also be investigated. It is anticipated that LC will become even more effective and widely available with further developments in minimally invasive surgical procedures, solidifying its position as the method of choice for gallbladder surgery.

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