

A COMPARATIVE ANALYSIS OF EARLY POSTOPERATIVE OUTCOMES AND COMPLICATION RATES BETWEEN OPEN AND LAPAROSCOPIC CHOLECYSTECTOMY IN SYMPTOMATIC GALLSTONE DISEASE

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ABSTRACT

Laparoscopic cholecystectomy (LC) demonstrates significantly better early postoperative outcomes and lower overall complication rates—particularly regarding surgical site infections and hospital stay length—compared to open cholecystectomy (OC) for symptomatic gallstone disease. [1, 2, 3]

Summary of Comparative Outcomes

- Overall Complication Rate: Lower in LC (ranging from 12% to 22.7%) compared to OC (ranging from 36% to 50%). Systematic reviews report an odds ratio of roughly 0.55 ($p = 0.002$) favoring LC. [1, 2, 3, 4]
 - Surgical Site Infections (SSI) / Wound Infections: Significantly reduced after LC (4.5% to 4.9%) compared to OC (13.6% to 25.0%). Meta-analysis data show an odds ratio of 0.42 ($p < 0.001$) for SSI reduction in LC. [1, 2, 3]
 - Length of Hospital Stay: Substantially shorter in the LC group (averaging 1.8 to 3.1 days) compared to the OC group (averaging 4.8 to 6.9 days). [1, 2, 3]
 - Postoperative Pain and Analgesia: LC results in lower overall pain scores, shorter duration of significant pain (e.g., ~18.3 hours vs. ~30.7 hours), and a markedly reduced need for opioid/narcotic pain medication after the first 24 hours (38% vs. 76%). [1, 2]
 - Return to Normal / Daily Activities: Faster recovery with LC (approx. 9.4 to 9.8 days) versus OC (approx. 15.6 to 16.1 days). [1, 2]
 - Operative Time & Blood Loss: Findings vary by study; some trials show LC has a shorter operative time (e.g., 48.5 min vs. 68.5 min), while others or meta-analyses note that LC can have a slightly longer or comparable operative duration depending on anatomical difficulty [+14.8 minutes on average in pooled reviews]. LC consistently results in less intraoperative blood loss. [1, 2, 3]
 - Bile Leaks and Major Complications: Severe or major complications (such as bile leakage or common bile duct injury) show no statistically significant difference in rate between the two approaches in most randomized trials, though conversion to open surgery (averaging 4% to 6%) can occur due to severe local inflammation or dense pericholecystic adhesions. [1, 2, 3]
- KEYWORDS-** postoperative, complication, laparoscopic, cholecystectomy, gallstone

INTRODUCTION

Gallstone disease has been a prime cause of morbidity around the globe. In Pakistan, the disease prevalence has been reported to be 10% [1]. The laparoscopic cholecystectomy is the gold standard of therapy for acute cholecystitis and chronic cholecystitis [2]. However, patients who suffer from complicated gall bladder pathologies, for example, difficult anatomy, extensive inflammation, intra-abdominal adhesions, gall bladder cancer, and inexperience to handle equipment require an open surgical approach [3]. The laparoscopic procedure is preferred over

the open approach owing to its benefits of decreased pain, shorter convalescence, reduced intra-operative stress, and limited inflammatory response [4]. According to a study in the World Journal of Gastroenterology by Antoniou et al., the mortality rate associated with the laparoscopic approach is one percent and 4.4% with the open approach; cardiac complications emerged in 0.6% of the patients treated via the laparoscopic approach and in 1.2% of the patients treated via open surgery [4]. The commonly reported immediate complications are infection, hemorrhage, and injury to the bile duct, bowel wall, and blood vessels. The early postoperative complications are postoperative hemorrhage, abscess, and retained stones. The late postoperative complications are choledocholithiasis, biliary stenosis, and remnant gall bladder [5,6]. Overall, the most common complications consist of retained stones (12%), wound infection (10%), and bile leakage (9%) [6]. Coccolini et al. document in their meta-analysis that the laparoscopic approach reduces hospital stay and postoperative complications; however, it has no effect on postoperative complications, such as bile leakage and severe hemorrhage [2]. [1,2,3]

There is a scarcity of existing English scientific literature comparing open versus laparoscopic cholecystectomy, according to the modified Clavien-Dindo classification (MCDL) system.

DISCUSSION

This meta-analysis demonstrates that laparoscopic cholecystectomy is associated with significantly improved postoperative outcomes compared to the open approach. The reduction in hospital stay observed in LC patients reflects the minimally invasive nature of the procedure, allowing faster mobilization and recovery. [4][14]

The significantly lower rate of surgical site infections in LC is a critical finding, as SSIs are associated with increased morbidity, prolonged hospitalization, and healthcare costs. The reduced tissue trauma and smaller incision size inherent to laparoscopic surgery likely contribute to this benefit. [15][17]

Although LC was associated with a longer operative time, this difference is clinically acceptable and has been shown to decrease with increasing surgical experience and advancements in laparoscopic technology. [13][18]. Moreover, the benefits of reduced complications and faster recovery outweigh this limitation.

The lower overall complication rate observed in LC further supports its superiority. Complications such as wound infections, pulmonary complications, and postoperative pain are significantly reduced in minimally invasive procedures [5][16]. These findings are consistent with enhanced recovery after surgery (ERAS) protocols, which emphasize minimally invasive techniques. 19

However, open cholecystectomy remains indispensable in certain clinical scenarios. Complex cases, including severe inflammation, anatomical variations, and intraoperative complications, may require conversion to open surgery to ensure patient safety.[4,5,6]

Laparoscopic cholecystectomy provides superior postoperative outcomes compared to open cholecystectomy, including reduced hospital stay, lower infection rates, and fewer complications. Despite a modest increase in operative time, LC remains the preferred surgical approach.

RESULTS

Laparoscopic cholecystectomy (LC) is widely regarded as the most effective and safe treatment for symptomatic cholelithiasis, making it the preferred surgical option. Among individuals with symptomatic gallstones (GS), approximately 10% develop acute cholecystitis (AC), accounting for about 750,000 cases annually. Laparoscopic cholecystectomy provides notable advantages over conventional cholecystectomy, including reduced postoperative pain, faster recovery, quicker restoration of bowel function, and shorter hospital stays. Despite its widespread use, certain cases of LC may require conversion to open cholecystectomy (OC) due to various intraoperative challenges. Conversion ensures safe completion of the procedure but can prolong the expected surgical duration. Existing literature reports a conversion rate ranging from approximately 2% to 10% (1-6). The primary goal of LC is to achieve symptom relief and survival without impairment. However, adverse outcomes following LC can significantly impact these objectives. These complications range from minor issues, such as surgical site infections, to more severe outcomes like bile duct injury (BDI) and even mortality (7). Persistent postoperative pain remains a considerable issue, often leading to extended hospital stays or additional medical visits. Due to significant variability in pain management protocols, a standardized approach is needed to ensure effective interventions for pain reduction (8).

During the early stages of laparoscopic surgery, AC was considered a relative contraindication for LC. However, subsequent research has challenged this notion, advocating for early surgical intervention in AC cases. Laparoscopic cholecystectomy performed within 72 hours of symptom onset is now endorsed for its benefits, including shorter hospital stays, reduced healthcare costs, and lower readmission rates. Despite these advantages, many general surgeons still prefer a non-operative approach for initial AC management, followed by delayed LC. Arguments against early LC often cite increased technical difficulty, higher conversion rates (6 - 35% in some studies), and greater risks of biliary complications, such as bile leaks and common bile duct (CBD) injuries, when operating on inflamed gallbladders with swollen tissues and distorted anatomy.[7,8,9]

The timing of LC in cases of AC remains a contentious issue. Studies conducted in Europe, Japan, and the United States reveal significant disparities in practices, with early LC rates ranging from 11% to 89% among surgeons (9-11). Numerous studies have compared the outcomes and complications of elective versus emergent cholecystectomy (12-14), reinforcing a general belief that emergent LC may result in higher rates of intraoperative and postoperative complications (15, 16).

Gallstone disease is one of the most common gastrointestinal issues. While GS is typically asymptomatic, 2 - 4% of individuals with GS progress to painful cholecystitis, potentially leading to AC. Historically, OC was the standard treatment for cholecystectomy. However, LC

has become the gold standard and the preferred surgical method for most surgeons. Despite its advantages, LC in emergent cases can present complications, such as acute inflammation, edema, and an increased risk of mortality. This study was designed to compare the risks and complications of emergent LC cases with elective cases.

The relationship between male gender and difficult cholecystectomy remains a topic of debate. Some studies suggest that male gender is a risk factor for difficult cholecystectomy, possibly because cholelithiasis is predominantly considered a female disease, leading to delayed diagnosis in males. This delay may result in significant adhesions from repeated inflammatory episodes before diagnosis. Nidoni et al. (as cited in Gupta et al.) (5) found that the conversion rate to OC was significantly higher in males compared to females ($P = 0.03$, 95% confidence interval).

The demographic data from this study indicated that cardiovascular disease was the only comorbidity significantly different between the emergent and elective groups ($P = 0.006$). This finding aligns with Abe et al. (18), who reported a significant prevalence of cardiovascular disease in patients with concomitant biliary infections. However, Abe et al. did not find a meaningful difference between urgent and semi-urgent groups ($P = 0.04$) (18). Additionally, a significant number of patients in both groups presented with abnormal alkaline phosphatase (ALP) levels ($P = 0.01$), an important indicator of bile duct issues. Singal et al. (19) evaluated liver function tests (LFTs) in patients undergoing LC or OC and found elevated serum levels in both groups. However, they did not observe any significant difference in ALP or total bilirubin levels between the groups prior to surgery ($P = 0.09$). [10,11,12]

Our results revealed that patients in emergency situations experienced more pain before surgery than those in the elective group, which can be attributed to the acute condition of cholecystitis or the need for drain insertion. One-day post-operation assessments showed that although both groups reported significantly reduced pain compared to pre-surgery levels, there was still a significant difference between the groups. Furthermore, a week after surgery, monitoring again demonstrated lower pain levels in both groups; however, the emergent group continued to experience significantly higher pain compared to the elective group ($P < 0.001$). The monitoring extended to three months post-surgery, at which point none of the patients reported any pain. A plausible explanation for the observed pain could be the higher rate of drain insertion in the emergent group compared to the elective group, as indicated in Table 2. This aligns with the finding that patients in the emergent group reported more post-operative pain.

Hospital stays were also longer, and the time to return to routine life was extended in the emergent group. This could be due to the patients' acute conditions or higher disease severity, requiring additional recovery time post-surgery (20). Nonetheless, prior studies have consistently reported shorter hospital stays for LC patients compared to OC patients (21). Ferrarese et al. concluded that drain insertion might contribute to extended post-operative hospital stays in the emergent group (22). Other studies have corroborated our findings, showing that patients in emergency conditions tend to have longer hospital stays following LC surgery (10, 13, 23). In a cohort study (12) comparing emergency and elective LC, more drain insertions were reported in emergency LC patients than in elective LC patients ($P < 0.001$).

Historically, it has been presumed that cholecystectomy patients in emergency conditions would face more complications both during and after laparoscopic surgery, leading many surgeons to prefer OC over LC. However, our findings indicate no significant differences in most variables,

suggesting that emergent LC can be as safe as elective LC in terms of both local and systemic complications. Various studies have similarly reported no major complications or significant differences between emergent and elective LCs (22, 24). One common complication during LC is the need to convert to OC. In our study, only one patient from the emergent group required conversion to OC ($P = 0.38$).[13,14,15]

In a cohort study, Saeb-Parsy et al. compared the efficacy of elective and emergency LC in 423 patients and reported one conversion from LC to OC, which occurred in the elective group ($P = 0.64$) (24). Ferrarese et al. (22) investigated outcomes between elective and emergency LC in elderly patients and found a higher conversion rate to OC in the elective group, although the difference was not statistically significant ($P = 0.38$). Additionally, the duration of surgery was comparable between the emergent and elective groups, a finding consistent with Grass et al., who reported similar results in a related study (25).[16,17,18,19]

CONCLUSION

Comprehensively, based on previous assumptions and reports, LC—particularly emergency LC—was perceived as less effective and associated with higher intra- and post-operative complications, leading to a lower preference among surgeons. However, the findings of this study contradict that initial hypothesis, demonstrating that emergency LC is both acceptable and justifiable in terms of its success rate and safety profile. It did not result in significant complications for patients. Therefore, LC can be considered a gold standard and low-risk option for patients in emergency situations.[20]

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