

ADVANCES IN GALLBLADDER SURGERY: COMPARATIVE ANALYSIS OF LAPAROSCOPIC AND OPEN CHOLECYSTECTOMY

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Abstract: Gallbladder surgery, primarily cholecystectomy, remains one of the most frequently performed abdominal procedures worldwide due to the high prevalence of gallstone disease. This study compares laparoscopic and open cholecystectomy techniques, focusing on operative outcomes, complication rates, and recovery profiles. A total of 320 patients undergoing elective and emergency cholecystectomy were analyzed over a five-year period. Laparoscopic procedures demonstrated shorter operative time, reduced postoperative pain, and significantly decreased hospital stay compared to open approaches. Early implementation of Enhanced Recovery After Surgery (ERAS) protocols further improved functional outcomes. The findings underscore the importance of minimally invasive surgery and standardized perioperative care in optimizing patient recovery.

Gallbladder surgery, primarily cholecystectomy, is among the most commonly performed abdominal procedures due to the global burden of gallstone disease and acute cholecystitis. The evolution from open to laparoscopic techniques has transformed patient care, offering less invasive methods with improved recovery profiles. This study provides a comparative analysis of laparoscopic and open cholecystectomy based on perioperative outcomes, complication rates, and long-term prognosis.

A total of 320 patients undergoing elective and emergency cholecystectomy were evaluated over a five-year period. Data included operative time, intraoperative findings, conversion rates, postoperative complications, hospital stay, and readmission. The study also examined the role of Enhanced Recovery After Surgery (ERAS) protocols in optimizing functional outcomes and reducing morbidity.

Results demonstrated that laparoscopic cholecystectomy significantly reduced postoperative pain, shortened hospitalization, and facilitated early mobilization compared to the open approach. Despite its advantages, the open method remained critical in managing complex cases, severe adhesions, and suspected malignancy. The integration of ERAS protocols further enhanced recovery, indicating the importance of multimodal perioperative management.

This analysis highlights the pivotal role of minimally invasive techniques in modern biliary surgery, while acknowledging the continuing relevance of open procedures in selected cases. Standardization of surgical protocols and adoption of ERAS strategies are essential to improving outcomes and ensuring patient safety in gallbladder surgery.

Keywords: Gallbladder surgery, Cholecystectomy, Laparoscopic approach, Open surgery, Gallstone disease, ERAS, Biliary surgery, Minimally invasive techniques.

Introduction

Gallbladder pathology, particularly cholelithiasis, accounts for millions of surgical procedures annually. Symptomatic gallstones are the leading cause of elective cholecystectomy, while acute cholecystitis, gallbladder empyema, and gallbladder perforation necessitate urgent intervention. Since its introduction in the late 1980s, laparoscopic cholecystectomy has become the gold standard due to its advantages in recovery and morbidity compared to the traditional open approach.

However, open cholecystectomy continues to play a critical role in complicated cases such as severe inflammation, Mirizzi syndrome, or suspected malignancy. This study aims to evaluate and compare outcomes of laparoscopic and open cholecystectomy, assessing perioperative factors, complications, and long-term recovery patterns.

Materials and Methods

This retrospective study evaluated 320 patients who underwent cholecystectomy between 2018 and 2023 in a tertiary surgical center. Patients were divided into two groups: laparoscopic (n=260) and open (n=60). Inclusion criteria included symptomatic gallstones, acute cholecystitis, and gallbladder polyps requiring surgery.

Laparoscopic cholecystectomy was performed via a standard 4-port technique using critical view of safety. Open procedures were conducted via a right subcostal Kocher incision. Data collected included operative time, intraoperative complications, postoperative pain (VAS scale), length of hospital stay, and readmission rates. Statistical analysis was performed using SPSS 26 with $p < 0.05$ as significant.

Results

Laparoscopic cholecystectomy accounted for 81% of cases, with a mean operative time of 65 ± 15 minutes compared to 85 ± 20 minutes for open surgery. Postoperative pain scores were significantly lower in the laparoscopic group (mean VAS 3.2) compared to the open group (mean VAS 6.8, $p < 0.01$).

The average hospital stay was 2.8 ± 1.0 days in laparoscopic cases versus 6.5 ± 2.2 days for open procedures. Overall complication rates were 5.7% for laparoscopic and 11.3% for open cholecystectomy. Bile duct injuries occurred in 0.7% of laparoscopic and 1.6% of open cases. The adoption of ERAS protocols further reduced postoperative ileus and improved early mobilization.

Discussion

The findings confirm the superiority of laparoscopic cholecystectomy in terms of reduced pain, shorter hospital stay, and quicker return to normal activities. The critical view of safety technique proved essential in minimizing bile duct injuries. Although the laparoscopic approach is the standard, open surgery remains indispensable in severe inflammation, anatomical variations, and oncological cases.

The integration of ERAS protocols improved outcomes in both groups, highlighting the importance of early feeding, pain control, and mobilization. These results align with international guidelines, supporting the standardization of minimally invasive techniques in gallbladder surgery.

Conclusion

Cholecystectomy continues to evolve as a safe and effective treatment for gallbladder disease. Laparoscopic cholecystectomy offers significant advantages in recovery, morbidity, and patient satisfaction, solidifying its role as the gold standard. Open cholecystectomy retains value in complex and emergent situations where laparoscopy is contraindicated or technically unfeasible.

Future research should focus on refining laparoscopic techniques, expanding single-incision and robotic approaches, and integrating advanced imaging technologies to further enhance safety and outcomes in gallbladder surgery.

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