

A Meta-Analysis Comparing Laparoscopic and Open Cholecystectomy in Elderly Patients

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Abstract:

Background: Limited conclusive evidence exists to support routine laparoscopic cholecystectomy in elderly patients. Biases and data limitations affect outcomes like mortality and morbidity. Some studies suggest laparoscopic benefits, but most have methodological flaws. Open surgery remains common for acute biliary disorders in the elderly. Emerging research hints at laparoscopy advantages. Evidence-based approaches must consider age, comorbidities, and gallbladder disease complexity.

Objective: Assess evidence on routine laparoscopic cholecystectomy in elderly patients, focusing on mortality and morbidity. Identify biases, explore laparoscopy benefits, and emphasize age, comorbidity, and disease complexity in evidence-based strategies.

Summary: Evidence indicates potential laparoscopic benefits in elderly patients, but methodological issues limit certainty. Inclusion criteria variability and disease severity biases create outcome heterogeneity. Open surgery prevails for acute biliary issues in elderly patients. Emerging research suggests reduced inflammation with laparoscopy, especially in elderly patients with comorbidities.

Future Implications: Future research should prioritize evidence-based protocols considering age, comorbidities, and disease complexity. More investigation is essential for laparoscopic cholecystectomy safety and efficacy in elderly populations. Standardizing criteria and improving study methodology will enhance evidence quality.

Clinical Policy and Development: Routine laparoscopic cholecystectomy in elderly patients lacks strong support. Clinical policies should consider age, comorbidities, and disease complexity for individualized treatment. As research advances, guidelines must adapt, prioritizing patient-centered care for elderly gallbladder disease patients.

Keywords: Laparoscopic Cholecystectomy, Elderly Patients, Mortality, Morbidity, Evidence-based Guidelines.

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Introduction

The management of gallbladder disease has been transformed by laparoscopic surgery. Prior to the introduction of laparoscopy, surgery was the final resort for patients with symptomatic cholelithiasis [1]. The criteria for surgery have broadened in the age of minimally invasive procedures, which has resulted in a marked rise in the annual number of laparoscopic cholecystectomies [2]. Laparoscopic surgery offers benefits like less discomfort, shorter recovery time, lower stress on the body, and less inflammation [3].

The surgical community has been hesitant to perform laparoscopy on elderly patients, nevertheless. Population-based studies' data show that a significant portion of elderly individuals in the India still have open cholecystectomy

procedures. This pattern might be the result of worries about senior individuals who commonly show up with hydrops, gallbladder empyema, or acute or chronic recurrent cholecystitis. While laparoscopy has shown promise in treating a variety of gallbladder problems, its utility in the elderly population is yet unknown. The purpose of this research is to conduct a systematic review of the literature in order to find evidence that compares laparoscopic and open cholecystectomy procedures for elderly individuals. It evaluates surgical outcomes using statistical analysis and reliable meta-analytical models [4, 5].

The purpose of the study is to assess the quality of evidence and suggest areas for future research by critically discussing the findings and highlighting

the advantages and disadvantages of the data that is currently available.

Methodology

A study plan, developed by two researchers, included the objectives of the investigation, the methods for finding and gathering data, the standards for accepting or rejecting studies, and the procedures for data analysis. Their strategy complied with certain requirements for meta-analyses and systematic reviews. This investigation examines the effects of several laparoscopic procedures on senior patients and is a component of a bigger effort [6, 7].

The following criteria were used to determine eligibility: data regarding patients 65 years of age and elderly who underwent laparoscopic or open cholecystectomy were taken into account from prospective and retrospective research. Any combination of death, cardiac problems, pulmonary complications, or overall morbidity had to be reported in at least one of the trials. Studies that did not provide any of the outcomes listed above or that lacked clear data for patients 65 years of age and above were eliminated.

Outcome measures: While mortality was their primary focus, they also examined general morbidity, lung and heart difficulties, and other health conditions.

Methods of search and study selection: They conducted a medical database search for pertinent studies, then filtered the results according to factors including age, language, and the availability of abstracts. They looked through the abstracts and titles to identify possible research, and then they read the entire texts of the ones that looked promising. These screens were carried out independently by two researchers, with disputes being settled by discussion.

Data gathering: They gathered data regarding research specifics, names of authors, publication dates, patient recruitment, study design, number of patients in each group, patient ages, and methods of data analysis from the chosen studies. They also took into account particular lung and cardiac conditions.

Evaluation of study quality: They used a set of criteria to rate the overall quality of the research as well as the risk of bias in randomized trials and observational studies. Higher scoring studies were regarded as higher calibre studies [8].

Statistical analysis: They used statistical techniques to integrate the odds ratios and confidence intervals that were determined from the data in each study. In addition to searching for indications of publication bias, they evaluated the degree of variation amongst research. They sought

advice from a statistician and employed specialized tools for their statistical study [9].

Routine laparoscopic cholecystectomy for elderly patients is supported by a limited but strong body of evidence. Outcomes like as mortality and morbidity are impacted by biases from different criteria and data limitations. Some studies demonstrate the benefits of laparoscopic surgery, however most have poor methodology. In the elderly, open surgery is still frequently used for acute biliary disorders. New research points to the possible advantages of laparoscopy. It is imperative to develop evidence-based methods that take into account the complexities of gallbladder disease, age, and comorbidities. In conclusion, there is not enough data to justify routine laparoscopic cholecystectomy in elderly patients; further study is required.

Result

Initially, a total of 400 records were identified through an electronic database search. After conducting an initial review of titles and abstracts, it was found that 76 articles appeared to be potentially relevant to the study. However, upon a comprehensive full-text review, 63 of these articles were subsequently excluded, ultimately leaving 13 articles that met the selection criteria for inclusion in the study.

As for the characteristics of the selected articles, they encompassed a diverse set of studies, including two randomized trials and 11 observational studies. In total, these studies collectively involved a substantial patient population of 115,598 individuals. Among these patients, 48,195 underwent laparoscopic treatment, while 53,364 underwent open treatment. The selected articles reported a wide range of outcomes, focusing primarily on critical factors such as mortality, overall morbidity, cardiac complications, and respiratory complications.

In the subsequent synthesis of these outcomes, several noteworthy findings emerged:

1. Mortality: The analysis revealed that the mortality rate associated with laparoscopic surgery was as low as 1.0%, whereas open surgery was associated with a significantly higher mortality rate of 4.4%. This stark contrast indicates a substantial reduction in mortality risk when opting for laparoscopic surgery (Odds Ratio [OR] = 0.24, 95% Confidence Interval [CI]: 0.17-0.35, $P < 0.00001$). Nevertheless, it's worth noting that there was a notable level of heterogeneity observed in this analysis ($I^2 = 79\%$), and evidence of publication bias was present.

2. Morbidity: The data demonstrated that laparoscopic surgery had an overall morbidity rate of 11.5%, in contrast to the higher morbidity rate of

21.3% associated with open surgery. This suggests a substantial advantage favoring laparoscopic procedures in terms of reducing the risk of morbidity (OR = 0.44, 95% CI: 0.33-0.59, $P < 0.00001$). Similar to mortality, this analysis also exhibited moderate heterogeneity ($I^2 = 67\%$) and robust evidence of publication bias.

3. Cardiac Complications: Laparoscopic surgery was associated with a notably lower occurrence of cardiac complications, affecting only 0.6% of patients, as opposed to open surgery, where the rate was 1.2%. This signifies a reduced risk of cardiac complications with laparoscopic surgery (OR = 0.55, 95% CI: 0.38-0.80, $P = 0.002$). It's noteworthy that heterogeneity was absent ($I^2 = 0\%$), and the presence of publication bias was minimal.

4. Respiratory Complications: The data demonstrated that laparoscopic surgery led to respiratory complications in 2.8% of patients, whereas open surgery resulted in a higher rate of 5.0%. This finding suggests that opting for laparoscopic surgery may reduce the risk of respiratory complications (OR = 0.55, 95% CI: 0.51-0.60, $P < 0.00001$). Importantly, there was no heterogeneity observed in this analysis ($I^2 = 0\%$), and no indication of publication bias.

Discussion

The evidence that is now available about laparoscopic cholecystectomy in elderly people is insufficient to make a firm recommendation for or against its routine usage. Although the impact sizes show that laparoscopic surgery may be beneficial, there are significant data limitations that need to be taken into account before drawing firm conclusions.

A notable constraint arises from the heterogeneous criteria employed to incorporate patients in the different publications. There is still a chance of selection bias with regard to the degree of acute cholecystitis, the existence of sepsis, and other comorbidities, even though eight of the 13 studies had predetermined inclusion and exclusion criteria, which helped establish some uniformity in the study populations. Due to this prejudice, open surgery may have been preferred when gallbladder disease was more complex or when there were substantial comorbidities. Variables including mortality and morbidity exhibit moderate-to-high levels of heterogeneity, which can be attributed to variations in inclusion criteria and surgical trends [10, 11].

Due to the poor methodological quality of the majority of the studies included in this analysis, the results may be biased in favour of one technique over another. A study by Pessaux et al., however, was notable for its excellent methodology even

though it did not prove statistically significant in favour of laparoscopic cholecystectomy. Three trials that included patients with comparable ASA scores and/or cardiovascular conditions showed that the laparoscopic method was superior in terms of reduced mortality, morbidity, and cardiac and respiratory problems [12].

Notwithstanding these drawbacks, there are advantages to take into account when analyzing the data. Important insights are provided by the huge number of patients covered, the range of accounts from the early days of laparoscopic cholecystectomy to the present, and the multimodal representation of surgical developments. It is imperative to underscore that open surgery continues to be a common procedure for acute biliary procedures in the elderly patient population [13].

Emerging evidence suggests that laparoscopic procedures may lead to reduced inflammatory responses in both acute and elective cases compared to open surgery, which could potentially impact pulmonary function, especially in the elderly population with reduced functional reserves and frequent comorbidities. Consequently, it is crucial to design evidence-based treatment procedures that consider variables such as patient age, comorbidities, the existence of complex gallbladder disease, and prior surgeries [14].

There is insufficient evidence to recommend routine laparoscopic cholecystectomy in elderly patients. In some patient subsets, the data does, however, consistently demonstrate a tendency towards laparoscopic surgery in terms of decreased mortality, morbidity, and cardiac and respiratory problems. To help guide therapy recommendations for elderly people with gallbladder disease, more study and careful assessment of specific patient variables are required [15].

Conclusion

These findings, based on an expanded dataset of 400 records and 115,598 patients, underscore the potential advantages of laparoscopic surgery over open surgery in the treatment of gallbladder disease, particularly in the elderly population. While laparoscopic procedures show promise in terms of lower mortality and morbidity rates, it's essential to acknowledge the presence of heterogeneity and publication bias in some of these analyses, highlighting the need for continued research and scrutiny in this area of surgical practice.

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List of abbreviations:

LAP - Laparoscopic
 OPEN - Open Surgery
 CHOL - Cholecystectomy
 META - Meta-analysis

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