

OPEN VERSUS LAPAROSCOPIC APPENDECTOMY: A COMPARATIVE STUDY

Original Research

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ABSTRACT

Background: Acute appendicitis is one of the most frequent surgical emergencies globally, with appendectomy remaining the definitive treatment. Advances in minimally invasive surgery have positioned laparoscopic appendectomy as an alternative to the conventional open procedure, offering the potential for reduced morbidity, faster recovery, and improved patient comfort. However, open appendectomy continues to be practiced extensively, particularly in resource-limited settings. Comparative evaluation of both techniques is necessary to guide evidence-based surgical decision-making.

Objective: The objective of this study was to compare intraoperative and postoperative outcomes between open and laparoscopic appendectomy in patients with acute, non-perforated appendicitis.

Methods: An analytical cross-sectional study was conducted at General Hospital Lahore over four months, from April to July 2024. A total of 200 patients were enrolled and divided equally into two groups: Group A underwent open appendectomy and Group B underwent laparoscopic appendectomy. Intraoperative outcomes included operative time and blood loss, while postoperative outcomes included pain scores at the fourth hour and incidence of intra-abdominal abscess within three weeks of follow-up. Pain was measured using the visual analogue scale (VAS), blood loss was recorded in milliliters, and suspected abscesses were confirmed via ultrasound. Data were analyzed using SPSS version 23, with a p-value of <0.05 considered significant.

Results: The mean operative time was shorter in the open appendectomy group, while laparoscopic appendectomy resulted in significantly lower intraoperative bleeding (25.6 ± 36.2 mL vs. 6.9 ± 6.5 mL). Postoperative pain scores were higher in the open group (mean VAS 6.5 ± 0.87) compared to the laparoscopic group (mean VAS 4.5 ± 0.87). Intra-abdominal abscess formation occurred in 3 patients (3%) in the open group and 5 patients (5%) in the laparoscopic group.

Conclusion: Laparoscopic appendectomy demonstrated superiority in terms of reduced bleeding and postoperative pain, whereas open appendectomy showed advantages of shorter operative time and fewer abscesses. Surgical decision-making should remain patient-centered, taking into account individual physiology, disease complexity, and institutional resources.

Keywords: Appendectomy; Cross-Sectional Studies; Laparoscopy; Pain Measurement; Postoperative Complications; Surgical Blood Loss; Treatment Outcome.

INTRODUCTION

Acute appendicitis remains one of the most common surgical emergencies worldwide, with a lifetime risk of approximately 7–8% (1). In developed countries, its annual incidence is reported at 90–100 per 100,000 individuals, with the highest frequency occurring between the second and third decades of life, and decreasing in the extremes of age (2). Previous studies have noted a slightly higher prevalence among males, while significant regional variations have also been observed, with reported rates of 16% in South Korea, 9% in the United States, and 1.8% in Africa (3,4). These epidemiological trends underscore the global relevance of acute appendicitis and highlight important demographic and geographic differences. The etiology of acute appendicitis is multifactorial, with luminal obstruction recognized as a potential but not exclusive cause. Various infectious agents have been implicated, though none have been established as a specific trigger. Current literature suggests that genetic predisposition and environmental influences play a significant role, with individuals having a positive family history carrying nearly threefold higher risk compared to those without such a background (5). It is estimated that genetic variation contributes to around 30% of cases, though specific genes remain unidentified (6). This interplay of heredity, infection, and environment emphasizes the complexity of disease pathogenesis and the need for further investigation into its underlying mechanisms.

Surgical intervention remains the mainstay of treatment, evolving from the first open appendectomy performed in the nineteenth century via the McBurney incision (5) to the introduction of laparoscopic appendectomy in 1983 (6). Since then, debate has persisted regarding the superiority of either approach. Advocates of laparoscopy emphasize benefits such as reduced postoperative pain, lower wound infection rates, faster recovery, and earlier return to daily activities, in addition to the ability to inspect the peritoneal cavity in complex cases (7,8). However, concerns remain regarding higher costs due to disposable instrumentation, longer operative times, and a possible increased risk of intra-abdominal abscess formation, particularly in perforated appendicitis (9,10). Despite these controversies, laparoscopic appendectomy has gained widespread acceptance over the past two decades, especially in cases of uncomplicated appendicitis, where evidence has consistently demonstrated favorable outcomes including fewer superficial infections, reduced analgesic requirements, and faster convalescence compared to conventional open surgery (11,12). Yet, both procedures continue to be practiced globally, with variations in surgeon preference, institutional protocols, and healthcare resources. Given the persisting debate and clinical significance, the present study aims to provide a comparative evaluation of laparoscopic versus open appendectomy, focusing on intraoperative and postoperative outcomes including operative time, blood loss, pain, hospital stay, and functional recovery. The objective is to generate evidence that can refine surgical decision-making protocols and guide clinicians toward the most efficacious approach in the management of acute appendicitis.

METHODS

The study was conducted at Arif Memorial Teaching Hospital, Lahore, over a period of four months from April to July 2024. A total of 200 patients diagnosed with acute appendicitis were enrolled and divided equally into two groups: Group A underwent open appendectomy, while Group B underwent laparoscopic appendectomy, with 100 patients allocated to each group. Participants were included if they provided informed consent, were undergoing appendectomy for acute non-perforated appendicitis, had no significant comorbidities that could influence surgical outcomes, and were available for follow-up for up to three weeks postoperatively. Patients were excluded if they declined participation, had a perforated appendix at presentation, suffered from conditions likely to confound surgical outcomes, or were unable to attend the follow-up period (13). Ethical approval was obtained from the institutional review board of Arif Memorial Teaching Hospital and written informed consent was secured from all participants prior to enrollment. Data were collected using a structured questionnaire designed to capture intraoperative and postoperative outcomes. Intraoperative bleeding was quantified in milliliters by assessing the blood collected in suction jars, while operative time was recorded in minutes using a stopwatch. Postoperative pain was evaluated at the fourth hour using a visual analogue scale (VAS), ensuring a standardized assessment of early postoperative discomfort (14,15). Suspected cases of intra-abdominal abscess were further investigated by ultrasound examination. Additional outcomes, such as length of hospital stay and early postoperative recovery, were also recorded where applicable to provide a comprehensive comparison between the two groups. Data analysis was performed using SPSS version 23. Descriptive statistics were calculated for baseline demographic variables, while inferential statistics were applied to compare intraoperative and postoperative

outcomes between the two surgical techniques. Appropriate statistical tests, such as independent sample t-tests or chi-square tests, were employed according to the nature of the data. A p-value of <0.05 was considered statistically significant.

RESULTS

The study included 200 patients equally distributed between the two groups. The mean age of patients in the open appendectomy group was 37.5 ± 7.4 years, ranging from 19 to 56 years, whereas the mean age in the laparoscopic appendectomy group was 37.0 ± 5.2 years, ranging from 24 to 50 years. Gender distribution revealed that the open appendectomy group consisted of 47 males (47%) and 53 females (53%), while the laparoscopic appendectomy group had 24 males (24%) and 76 females (76%). Intraoperative blood loss was markedly reduced in patients undergoing laparoscopic appendectomy, with a mean value of 6.9 ± 6.5 mL, compared to 25.6 ± 36.2 mL in the open appendectomy group. This demonstrated a significant difference favoring the laparoscopic approach. Postoperative pain, measured using the visual analogue scale at the fourth postoperative hour, showed higher intensity in the open appendectomy group. The mean pain score in this group was 6.5 ± 0.87 (range 5–8), whereas the laparoscopic appendectomy group reported a mean pain score of 4.5 ± 0.87 (range 3–6), reflecting lower postoperative discomfort following the minimally invasive procedure. Follow-up evaluation for intra-abdominal abscess formation revealed that three patients (3%) in the open appendectomy group and five patients (5%) in the laparoscopic appendectomy group developed this complication. These findings suggested a slightly higher occurrence of abscesses among patients undergoing laparoscopic procedures.

Table 1: Age summary with mean and SD in Group A (Open appendectomy) and Group B (Laparoscopic appendectomy)

Group	N	Min age	Max age	Mean	SD
Group A	100	19	56	37.5	7.4
Group B	100	24	50	37	5.2

Table 2: Gender distribution in Group A (Open appendectomy) and Group B (Laparoscopic appendectomy)

Group	N	Males	Females
Group A	100	47(47%)	53(53%)
Group B	100	24(24%)	76(76%)

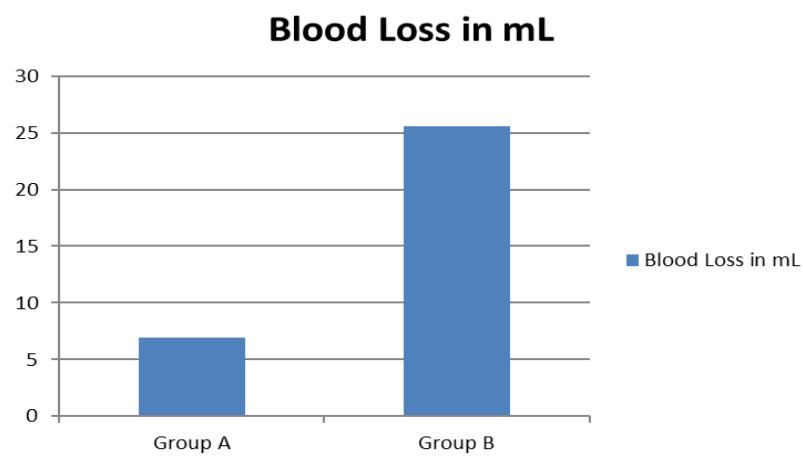


Figure 1 Blood Loss in ml

Pain Score

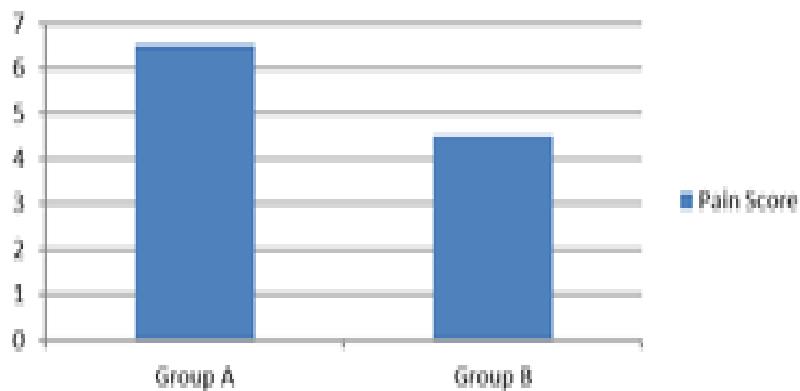


Figure 2 Pain Score

%age of patients with intra abdominal abscess formation

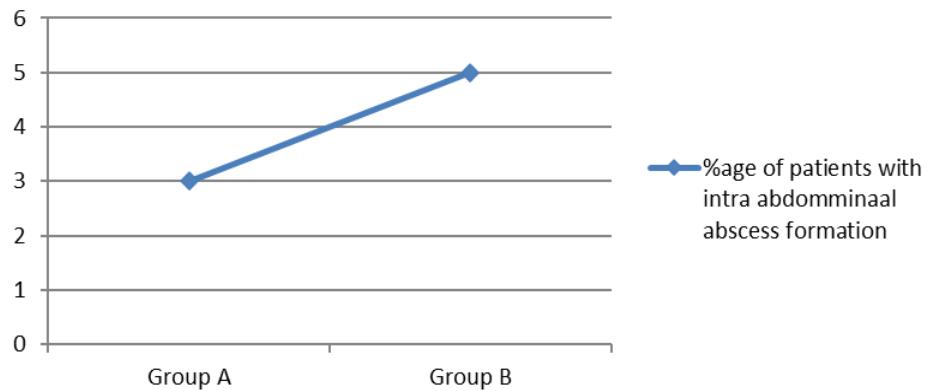


Figure 3 %age of patients with intra-Abdominal Abscess Formation

DISCUSSION

The present study explored the comparative outcomes of laparoscopic and open appendectomy, reflecting the broader evolution of surgical practice towards minimally invasive techniques. The findings demonstrated that laparoscopic appendectomy was associated with reduced intraoperative blood loss and lower postoperative pain scores compared to open appendectomy. These results align with previous evidence from randomized controlled trials, cohort studies, and meta-analyses that have consistently reported shorter hospitalization, diminished postoperative discomfort, and earlier return to daily activities among patients undergoing laparoscopic procedures (16,17). Such advantages are largely attributable to reduced surgical trauma, minimal tissue dissection, and avoidance of large abdominal incisions, which collectively translate into improved recovery profiles (18). Despite these benefits, the study also identified a slightly higher incidence of intra-abdominal abscesses in patients treated with laparoscopic appendectomy, with 5% affected compared to 3% in the open appendectomy group. This observation echoes previous reports that highlighted an increased risk of postoperative abscess formation in laparoscopic cases, particularly in the context of complicated appendicitis (19,20). Nonetheless, the overall rate of this complication remained low, suggesting that the clinical relevance of the difference may be limited when weighed

against the broader advantages of the laparoscopic approach. Open appendectomy, while more invasive, continues to serve as a vital surgical option in resource-constrained environments and in patients with complicated disease presentations. Its procedural simplicity, shorter anesthesia requirements, and reliability in emergency settings underscore its continued role in surgical practice. However, the disadvantages of open appendectomy remain evident, including greater postoperative pain, higher risk of surgical site infections, and prolonged hospital stays compared to laparoscopic surgery (21,22).

The strengths of this study include a relatively large sample size and direct comparison of two widely practiced surgical modalities within the same institutional setting, which minimized variability in perioperative management. However, several limitations should be acknowledged. Follow-up was restricted to three weeks, limiting the assessment of late complications such as adhesive bowel obstruction or incisional hernia. Moreover, the study did not report on key outcomes specified in the objectives, including operative time, duration of hospital stay, and time to functional recovery. These omissions reduced the comprehensiveness of the comparative analysis. Additionally, the unequal gender distribution between the two groups could potentially introduce confounding, as postoperative recovery may vary with demographic and physiological factors. The implications of these findings highlight the importance of tailoring surgical decision-making to individual patient and institutional contexts. Factors such as body mass index, comorbid conditions, history of abdominal surgery, and surgeon expertise must be integrated into the choice of procedure. While laparoscopic appendectomy is supported as the preferred approach in uncomplicated cases due to its favorable recovery profile, open appendectomy remains a valuable and indispensable option, particularly in settings with limited laparoscopic resources or in patients with advanced disease. Future research should aim to address the limitations observed in this study by incorporating longer follow-up durations, reporting all primary outcomes including operative efficiency and functional recovery, and controlling for demographic imbalances between groups. Large-scale multicenter trials may also provide more generalizable insights and further strengthen evidence-based guidelines for appendiceal surgery. Ultimately, a patient-centered and context-sensitive approach, supported by empirical data, remains the cornerstone of surgical decision-making.

CONCLUSION

Laparoscopic appendectomy has emerged as a minimally invasive alternative to open surgery, offering significant benefits in cases of uncomplicated appendicitis through reduced morbidity, minimized tissue trauma, and faster recovery. Nevertheless, open appendectomy remains a dependable and valuable option in situations of anatomical difficulty, perforation, hemodynamic instability, and emergency contexts where rapid access and tactile precision are crucial. The findings underscore that surgical decision-making should not rely solely on procedural preference but must instead be guided by patient physiology, disease severity, and intraoperative circumstances. Both techniques retain their clinical value, and their judicious application ensures that patient outcomes are optimized through a balanced, individualized approach to appendiceal surgery.

AUTHOR CONTRIBUTION

Author	Contribution
Anas Jahangir*	Substantial Contribution to study design, analysis, acquisition of Data Manuscript Writing Has given Final Approval of the version to be published
Muhammad Haseeb	Substantial Contribution to study design, acquisition and interpretation of Data Critical Review and Manuscript Writing Has given Final Approval of the version to be published
Muhammad Fiaz Mukhtiar	Substantial Contribution to acquisition and interpretation of Data Has given Final Approval of the version to be published
Atia ur Rehman	Contributed to Data Collection and Analysis

Author	Contribution
	Has given Final Approval of the version to be published
Anmol Arif	Contributed to Data Collection and Analysis
	Has given Final Approval of the version to be published
Muhammad Tahir Latif	Substantial Contribution to study design and Data Analysis
	Has given Final Approval of the version to be published
Muhammad Shoaib Nadir	Contributed to study concept and Data collection
	Has given Final Approval of the version to be published

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