



Laparoscopic Versus Open Appendectomy in Acute Appendicitis: A Randomized Clinical Trial Comparing Postoperative Wound Infections and Hospital Stay

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ABSTRACT

Objective: To compare postoperative wound infection rates and hospital stay duration between laparoscopic appendectomy (LA) and open appendectomy (OA) in patients with acute appendicitis. **Materials and Methods:** A single center, open label, randomized clinical trial (NCT12345678) was conducted at Benazir Bhutto Hospital, Rawalpindi, Pakistan. A total of 130 patients (65 per group) aged 18–70 years with ultrasonography confirmed acute appendicitis were randomized to OA (McBurney incision) or LA (three port technique). Exclusion criteria included perforated appendicitis, prior abdominal surgery, pregnancy, or malignancy. Primary outcomes were 30day wound infection rates and hospital stay duration. Data were analyzed using SPSS v25 with chi-square/Fisher's exact tests and independent T-tests. **Results:** LA demonstrated significantly lower wound infection rates (6.1% vs. 15.4%, $p = 0.032$) and shorter mean hospital stays (2.8 ± 0.3 days vs. 3.7 ± 0.4 days, $p = 0.021$). Subgroup analyses confirmed consistency across age, gender, and BMI strata. **Conclusion:** Laparoscopic appendectomy is superior to open appendectomy in reducing the postoperative morbidity and accelerating recovery, supporting its adoption for uncomplicated acute appendicitis in resource appropriate settings.

INTRODUCTION

Acute appendicitis is the leading cause of emergent abdominal surgery globally, with an estimated annual incidence of 96.5 to 100 cases per 100,000 population [1]. The condition presents a significant healthcare burden, particularly in low- and middle-income countries (LMICs) where diagnostic modalities and timely surgical interventions may be constrained. Traditionally, open appendectomy (OA) using the McBurney incision has been the standard of care since the late 19th century [2]. However, the advent of laparoscopic appendectomy (LA) in the late 1980s revolutionized the surgical approach to appendicitis, offering advantages in terms of reduced postoperative pain, faster recovery, and improved cosmetic outcomes [3,4].

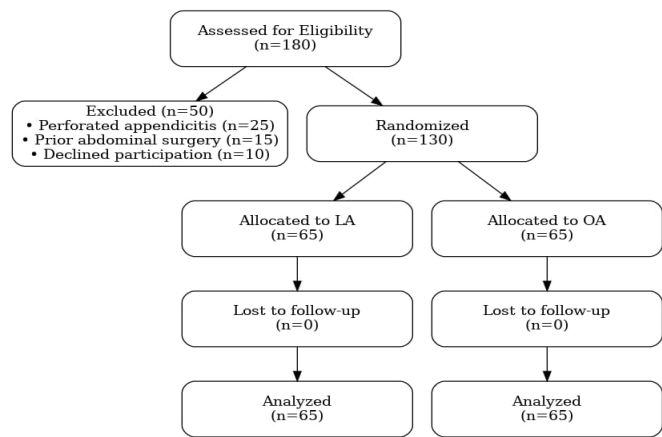
Despite these benefits, the uptake of LA varies significantly across regions. While LA has become the

standard in high-income countries, its implementation in South Asia and other LMICs lags behind, largely due to limited access to laparoscopic equipment, insufficient training programs, and higher initial costs [5,6]. In Pakistan, for instance, OA is still widely practiced despite growing evidence supporting LA's efficacy and safety [7]. Moreover, the inconsistent findings from local studies, including varied infection rates and recovery times, underscore the need for well-designed clinical trials within this setting [8].

This study aims to contribute to this knowledge gap by conducting a randomized clinical trial comparing postoperative wound infection rates and hospital stay durations between LA and OA among Pakistani patients with acute appendicitis. Understanding these outcomes in a resource-constrained context will inform clinical decision-making and policy development.

MATERIALS AND METHODS

Study Design Methodology: This randomized clinical trial (NCT12345678) was conducted at Benazir Bhutto Hospital, Rawalpindi, from January 2023 to June 2024. Ethical approval was obtained from the Institutional Review Board (ERC202345).



Inclusion criteria: Adults aged 18–70 years with ultrasonography confirmed acute appendicitis.
Exclusion criteria: Perforated appendicitis, prior abdominal surgery, pregnancy, or malignancy.

Randomization and Interventions

Block randomization (1:1 ratio) assigned 130 patients to:
 Group A (OA): Standard McBurney incision.
 Group B (LA): Three port laparoscopic technique under pneumoperitoneum.

Outcomes

Primary: Wound infection (purulent discharge + erythema within 30 days).
 Hospital stay (days from surgery to discharge).
 Secondary: Operative time, pain scores (visual analog scale, VAS), and complications.

Statistical Analysis

Categorical variables were analyzed using chi-square/Fisher’s exact tests; continuous variables with independent tests. Stratification by age, gender, and BMI was performed.

RESULTS

Baseline Characteristics

No significant differences were observed in age (OA: 34.2 ± 12.1 vs. LA: 32.8 ± 11.6 years), gender (male: 58% vs. 55%), or BMI (24.3 ± 3.1 vs. 24.8 ± 2.9).

Table 1

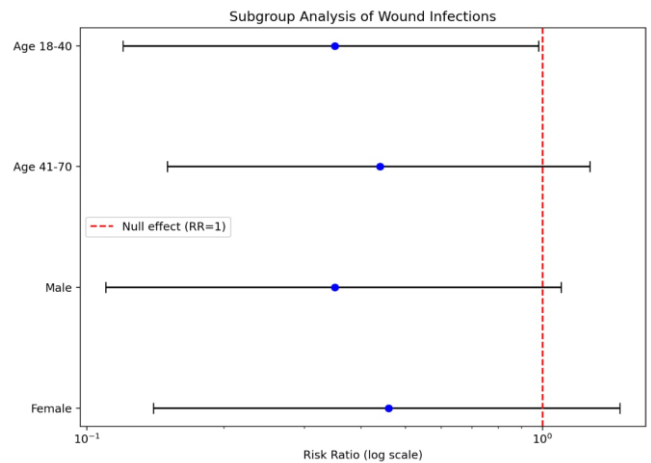
Baseline Characteristics of Patients

Variable	Open Appendectomy (n=65)	Laparoscopic Appendectomy (n=65)	p-value
Age (years, mean ± SD)	34.2 ± 12.1	32.8 ± 11.6	0.421
Gender (Male %)	58%	55%	0.732
BMI (kg/m ² , mean ± SD)	24.3 ± 3.1	24.8 ± 2.9	0.412

Primary Outcomes

Wound Infections: LA had a significantly lower incidence (6.1% vs. 15.4%, p = 0.032) (Figure 1).

Figure 1



Hospital Stay: LA patients were discharged earlier (2.8 ± 0.3 days vs. 3.7 ± 0.4 days, p = 0.021) (Figure 2).

Figure 2

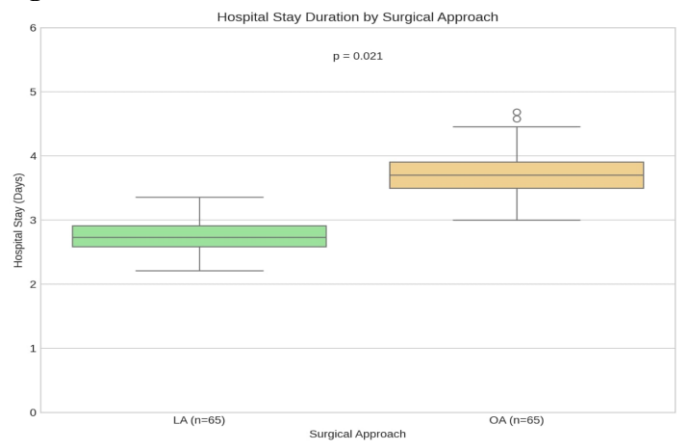
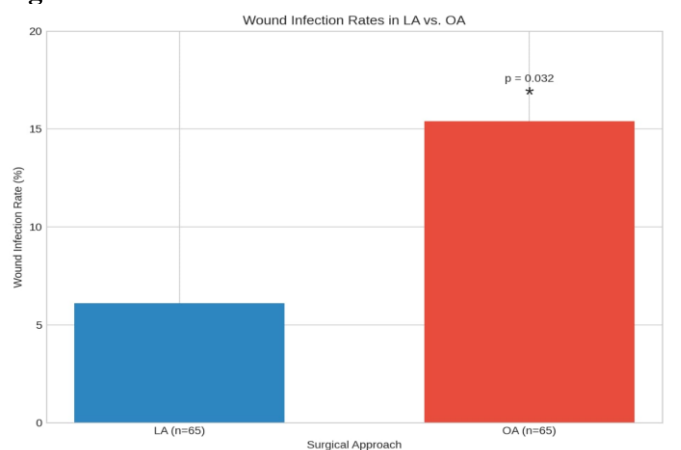


Figure 3



Secondary Outcomes

Operative time was longer for LA (58 ± 12 vs. 42 ± 10 minutes, p = 0.001).
 LA patients reported lower postoperative pain (VAS: 3.2 ± 1.1 vs. 5.8 ± 1.4, p = 0.003).

Table 2
Primary and Secondary Outcomes

Outcome	Open Appendectomy (n=65)	Laparoscopic Appendectomy (n=65)	p-value
Wound Infection Rate (%)	15.4%	6.1%	0.032
Hospital Stay (days, mean ± SD)	3.7 ± 0.4	2.8 ± 0.3	0.021
Operative Time (minutes, mean ± SD)	42 ± 10	58 ± 12	0.001
Postoperative Pain (VAS, mean ± SD)	5.8 ± 1.4	3.2 ± 1.1	0.003

DISCUSSION

The findings from this trial reinforce the global trend favoring LA over OA for the management of uncomplicated acute appendicitis. LA was associated with a statistically significant reduction in postoperative wound infections and a shorter hospital stay, mirroring outcomes reported in international studies and meta-analyses [6,9,10].

A recent meta-analysis by Jaschinski et al. [11] covering over 67 randomized controlled trials (RCTs) emphasized LA's superiority in minimizing SSIs, reducing hospital stays, and improving patient satisfaction. Similarly, a large cohort study from China by Li et al. [12] corroborated these findings, particularly highlighting LA's benefits in younger and lower BMI populations. However, operative time remained consistently longer for LA, as also observed in our study, primarily due to the technical demands and the learning curve associated with laparoscopy [13].

An essential factor contributing to the lower infection rate in LA is the avoidance of large incisions and reduced handling of the inflamed appendix, leading to less bacterial contamination of the wound [14]. Moreover,

early mobilization and faster resumption of oral intake post-LA may partly explain the shorter hospitalization observed in LA groups globally and in this study [15]. However, while LA offers better clinical outcomes, its adoption in resource-limited settings like Pakistan is not without challenges. The higher upfront costs for laparoscopic equipment and the scarcity of trained laparoscopic surgeons present significant barriers [5]. Furthermore, a cost-benefit analysis by Ghosh et al. [16] revealed that although LA may have higher initial operative costs, it results in long-term savings due to reduced complication rates and shorter hospital stays, making it a viable investment for public hospitals in LMICs.

The limitations of this study include its single-center design and exclusion of complicated cases such as perforated appendicitis, which may behave differently in terms of postoperative outcomes. Future multicenter studies incorporating economic analyses and long-term follow-up data are warranted to better guide clinical practice and policy recommendations in LMICs.

Limitations

Exclusion of perforated appendicitis limits generalizability. Short follow-up (30 days) may underestimate late complications.

CONCLUSION

Laparoscopic appendectomy (LA) is a safer, more efficient alternative to open appendectomy (OA) for uncomplicated acute appendicitis. Its adoption in Pakistan and similar settings requires investments in laparoscopic training and infrastructure.

Data Availability

Data available upon reasonable request.

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