

OUTCOMES OF OPEN AND LAPAROSCOPIC APPENDECTOMY IN MARDAN MEDICAL COMPLEX, MTI MARDAN

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ABSTRACT

Acute appendicitis represents a common emergency surgical condition worldwide. Appendectomy, performed either through open or laparoscopic techniques, remains the gold standard treatment. Although laparoscopic appendectomy is increasingly favored due to its minimally invasive nature, its advantages must be weighed against the longer anaesthesia duration and increased resource requirements, particularly in settings with limited resources.

Study Design: Comparative Cross-Sectional Study.

Department of Surgery, Mardan Medical Complex, MTI Mardan, Khyber Pakhtunkhwa, Pakistan. Study duration: From 11 February 2026 to 11 July 2026.

Sixty patients aged 18 to 60 years with acute appendicitis who underwent appendectomy were included in the study. Allocation to open appendectomy (n=20) or laparoscopic appendectomy (n=40) was determined by clinical judgment, patient preference, and the operating surgeon's available resources. The primary outcomes assessed were anaesthesia duration, hospital length of stay, time to tolerance of oral intake, and postoperative analgesic requirement. Data were analyzed using IBM SPSS (version 26). Independent-samples t-tests were used for continuous variables, while Chi-Square or Fisher's exact tests were applied to categorical variables. Statistical significance was set at $p < 0.05$.

The mean age of patients was 30.10 ± 7.22 years. The laparoscopic group had a significantly longer anaesthesia duration compared to the open group (77.95 ± 10.81 minutes versus 65.30 ± 7.18 minutes; $p < 0.001$). Conversely, laparoscopic appendectomy was associated with a shorter hospital stay (1.77 ± 0.46 days versus 3.67 ± 0.61 days; $p < 0.001$), earlier tolerance of oral intake (15.51 ± 3.98 hours versus 27.87 ± 5.57 hours; $p < 0.001$), and a lower postoperative analgesic requirement (30.0% versus 70.0%; $p = 0.003$).

Although laparoscopic appendectomy is associated with a longer anaesthesia duration compared to open appendectomy, it confers advantages in early postoperative recovery, including shorter hospital stay, earlier oral intake, and reduced analgesic requirement. In institutions with adequate expertise and resources, laparoscopic appendectomy should be considered the preferred initial surgical treatment for uncomplicated acute appendicitis. However, these findings may not be generalizable to all patient populations.

KEYWORDS: Acute appendicitis, Appendectomy, Laparoscopy, Open appendectomy, Hospital stay, Postoperative pain, Oral intake

INTRODUCTION

Acute appendicitis is among the most common surgical emergencies worldwide, imposing a significant burden on healthcare systems. The lifetime risk is estimated at 7–8%, with peak incidence occurring in the second and third decades of life. Surgical intervention, either open or laparoscopic appendectomy, remains the definitive treatment. Open appendectomy, first described by McBurney in 1894, is straightforward, requires only basic surgical instruments, and is accessible even in resource-limited settings. However, it necessitates a larger incision, resulting in greater abdominal wall trauma, increased pain, prolonged inactivity, and extended hospitalization. Since Semm's introduction of laparoscopic appendectomy in 1983, advantages such as improved visualization of intra-abdominal structures, smaller incisions, reduced tissue trauma, and faster postoperative recovery have been recognized. Laparoscopic techniques are particularly beneficial in cases of diagnostic uncertainty, atypical presentations, or suspected alternative intra-abdominal pathology. Nevertheless, laparoscopic appendectomy requires general anaesthesia, pneumoperitoneum, specialized instruments, and advanced surgical skills, which may increase operative and anaesthetic times, especially in low-volume or less experienced centers. The choice of surgical approach should consider institutional expertise, surgeon experience, patient characteristics, and measurable postoperative outcomes. Key outcomes include anaesthesia duration, hospital stay, postoperative analgesic requirement, and time to oral intake, all of which influence patient recovery, resource utilization, and

treatment costs. Due to variability in case selection, surgical training, perioperative management, and discharge protocols, local outcome data are essential. This study therefore compared the outcomes of open and laparoscopic appendectomy for acute appendicitis at Mardan Medical Complex, MTI Mardan, Pakistan.

METHODOLOGY

This comparative cross-sectional study was conducted in the Department of Surgery, Mardan Medical Complex, MTI Mardan, Khyber Pakhtunkhwa, Pakistan, over five months from 11 February 2026 to 11 July 2026. Ethical approval was obtained from the Institutional Ethics Committee, and all patients provided written informed consent after being informed about the study's purpose, benefits, and potential risks. The sample size was calculated using proportions of 65.5% for open appendectomy and 20.7% for laparoscopic appendectomy, with 95% confidence and 80% power in OpenEpi, resulting in 60 patients. Inclusion criteria were age between 18 and 60 years, diagnosis of acute appendicitis, and undergoing either open appendectomy (OAE) or laparoscopic appendectomy (LAE). Exclusion criteria included prior abdominal surgery likely to alter the surgical approach, gangrenous or perforated appendicitis, pregnancy, and other abdominal or pelvic conditions requiring a second operative procedure. Allocation was non-randomized and based on the surgeon's clinical judgment, patient condition, feasibility of laparoscopic surgery, and available resources. The potential for selection bias was acknowledged. Ultimately, 20 patients (33.3%) underwent open appendectomy and 40 (66.7%) underwent laparoscopic appendectomy. Baseline characteristics such as age, gender, residence, socioeconomic status, comorbidities, and procedure type were collected using a standardized proforma, and all patients underwent a protocol-mandated preoperative assessment. Outcomes measured included anaesthesia time (from induction to extubation), hospital stay (days from surgery to discharge), time to tolerance of oral intake (hours post-surgery until oral intake was tolerated without significant symptoms), and postoperative analgesic requirement (need for pain medication beyond routine perioperative analgesics). Data were entered and analyzed using IBM SPSS Version 26. Continuous variables were reported as mean $\pm$ standard deviation, and categorical variables as frequency and percentage. Independent sample t-tests were used for continuous outcomes, and chi-square or Fisher's exact tests for categorical variables. Statistical significance was set at $p \leq 0.05$. This design facilitated comparison of perioperative and postoperative outcomes between the two appendectomy approaches in this setting. Procedures were performed according to surgeon preference, reflecting routine clinical practice, which may limit the generalizability of the findings.

RESULTS

A total of 60 patients with acute appendicitis were included in the study. The mean age was 30.10 ± 7.22 years. Among the participants, 36 (60.0%) were male and 24 (40.0%) were female. Regarding residence, 36 patients (60.0%) were from rural areas and 24 (40.0%) from urban areas. Socioeconomic status was intermediate in 34 patients (56.7%), low in 14 (23.3%), and high in 12 (20.0%). Diabetes mellitus was present in 3 patients (5.0%), hypertension in 5 (8.3%), and 52 (86.7%) had no documented comorbidities. The majority of the cohort were young adults, predominantly male, with a slight predominance of rural residents and intermediate socioeconomic status. Forty patients (66.7%) underwent laparoscopic appendectomy, while 20 (33.3%) underwent open appendectomy (Table I). Analgesic use in the immediate postoperative period was required in 26 patients (43.3%), while 34 (56.7%) did not require additional analgesia. The mean anaesthesia duration was 73.73 ± 11.40 minutes, mean hospital stay was 2.40 ± 1.04 days, and mean time to tolerance of oral intake was 19.63 ± 7.42 hours (Table II). These values provide a reference for the entire cohort prior to stratification by surgical approach. Comparison between groups revealed that the laparoscopic group had a significantly longer anaesthesia duration (77.95 ± 10.81 minutes versus 65.30 ± 7.18 minutes; $p < 0.001$), but a shorter hospital stay (1.77 ± 0.46 days versus 3.67 ± 0.61 days; $p < 0.001$) and earlier resumption of oral intake (15.51 ± 3.98 hours versus 27.87 ± 5.57 hours; $p < 0.001$). Postoperative analgesic requirement was also significantly lower in the laparoscopic group (30.0% versus 70.0%; $p = 0.003$) (Table III, Figures 1–4). All differences were statistically significant ($p < 0.05$).

Table I: Demographic and Clinical Characteristics of Patients (n = 60)

Variable	Mean $\pm$ SD / n (%)
Age (years)	30.10 ± 7.22
Gender	
Male	36 (60.0%)
Female	24 (40.0%)

Residence	
Rural	36 (60.0%)
Urban	24 (40.0%)
Socioeconomic Status	
Low	14 (23.3%)
Middle	34 (56.7%)
High	12 (20.0%)
Comorbidities	
Diabetes mellitus	3 (5.0%)
Hypertension	5 (8.3%)
Others / none documented	52 (86.7%)
Type of Procedure	
Open appendectomy	20 (33.3%)
Laparoscopic appendectomy	40 (66.7%)

Table II: Overall Postoperative Outcomes (n = 60)

Outcome	Frequency / Mean $\pm$ SD	Percentage
Need for Analgesia		
Yes	26	43.3%
No	34	56.7%
Duration of Anaesthesia (minutes)	73.73 $\pm$ 11.40	—
Hospital Stay (days)	2.40 $\pm$ 1.04	—
Time to Tolerance of Oral Intake (hours)	19.63 $\pm$ 7.42	—

Table III: Comparison of Postoperative Outcomes According to Procedure Type

Outcome	Open (n=20)	Appendectomy Laparoscopic Appendectomy (n=40)
Duration of Anaesthesia (minutes), mean $\pm$ SD	65.30 $\pm$ 7.18	77.95 $\pm$ 10.81

Hospital Stay (days), mean $\pm$ SD	3.67 $\pm$ 0.61	1.77 $\pm$ 0.46
Time to Tolerance of Oral Intake (hours), mean $\pm$ SD	27.87 $\pm$ 5.57	15.51 $\pm$ 3.98
Need for Analgesia: Yes	14 (70.0%)	12 (30.0%)
Need for Analgesia: No	6 (30.0%)	28 (70.0%)

*Chi-square test; **Independent sample t-test.

Figure 1: Postoperative analgesic requirement according to procedure type.

Figure 2: Mean duration of anaesthesia according to procedure type. Error bars represent standard deviation.

Figure 3: Mean length of hospital stay according to procedure type. Error bars represent standard deviation.

Figure 4: Mean time to tolerance of oral intake according to procedure type. Error bars represent standard deviation.

DISCUSSION

A comparison of the early postoperative outcomes of open versus laparoscopic appendectomy: A systematic review and meta-analysis of randomised controlled trials. **CONCLUSION:** The primary outcome was that length of hospital stay, time to oral feeding, and postoperative analgesic requirement were lower in the group of laparoscopic appendectomy. Laparoscopic appendectomy was, however, associated with a significantly longer duration of anaesthesia than open appendectomy.

The increased anaesthesia time in the laparoscopic arm is clinically plausible. It can be explained by the additional steps of laparoscopic appendectomy: placement of laparoscopic ports, pneumoperitoneum, camera exploration and intracorporeal dissection. This results in longer operating and anaesthetic time, particularly with less experienced surgeons. On the other hand, open appendectomy offers access to the appendix and is much faster for uncomplicated situations. Individual decision-making should weigh the operative benefits of laparoscopy against the implications of longer anaesthesia times.

Patients undergoing laparoscopic appendectomy experienced a significantly shorter hospital stay, which is both clinically and economically important, as length of stay reflects patient recovery and resource utilization. The reduced hospital stay may be attributed to the minimally invasive nature of laparoscopic surgery, resulting in smaller incisions, less postoperative pain, and more rapid mobilization.

Another notable advantage of laparoscopic appendectomy was the shorter time to initiation of oral feeding, which serves as an important indicator of functional recovery. Laparoscopic surgery involves less bowel manipulation, leading to a reduced acute inflammatory response and faster restoration of gastrointestinal function. Patients in the laparoscopic group tolerated oral intake approximately 12 hours earlier than those in the open appendectomy group.

The laparoscopic group demonstrated a significantly lower requirement for postoperative analgesics, consistent with the biological advantage of smaller port sites causing minimal incisional trauma. Reduced pain facilitates earlier mobilization, decreases opioid consumption, enhances patient comfort, and expedites hospital discharge. These results are consistent with previous literature indicating that laparoscopic appendectomy offers superior outcomes for uncomplicated acute appendicitis when appropriate expertise and resources are available. However, open appendectomy remains a valid clinical option in settings where laparoscopy is unavailable, contraindicated, or technically infeasible. Surgical procedures should be individualized based on patient safety, institutional resources, surgeon skill level, and procedural appropriateness. Although the difference in anaesthesia duration between groups (~12.65 minutes) is statistically significant, it may not be clinically meaningful in this context. This difference reflects the additional steps required in laparoscopy. Importantly, the longer anaesthesia time did not adversely affect postoperative recovery, as the laparoscopic group still experienced shorter hospital stays, earlier oral intake, and reduced analgesic requirements. Nevertheless, the increased anaesthesia duration should be considered alongside the benefits of faster recovery, shorter hospitalization, and lower analgesic use.

CONCLUSION

Laparoscopic appendectomy is superior to open appendectomy for early postoperative recovery in patients with acute appendicitis. It is associated with shorter hospital stay, earlier tolerance of oral intake, and lower postoperative analgesic use. These advantages should be weighed against the disadvantage of prolonged anaesthesia duration. Laparoscopic appendectomy should be performed as first-line operation for uncomplicated acute appendicitis in properly selected patients, and in hospitals with the required laparoscopic skills and infrastructure.

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