

Comparison of Laparoscopic Versus Open Appendectomy in Complicated Appendicitis

ABDUL GHAFFAR ARAIN¹

¹Senior Registrar, Department of Surgery, Baqai Medical University, Karachi
Correspondence to: Abdul Ghaffar Arain, Email: ghaffardr@live.com

ABSTRACT

Background: Complicated appendicitis is often associated with numerous postoperative risks, making it a challenging surgical complication. Laparoscopic appendectomy is commonly performed for uncomplicated cases; however, its role in complicated appendicitis is still under investigation. For the purpose of this investigation, the objective is to evaluate the results which follow clinical practices of performing laparoscopic and open appendectomy in patients with complicated appendicitis.

Methods: From November 2017 to November 2018, a comparative observational study was conducted at the Civil Hospital Karachi's Surgical Department. Among the selected patients with complicated appendicitis, 79 'of these patients, 39 underwent laparoscopic appendectomy while 40 underwent open appendectomy'. The studied variables included 'operative time, hospital stay, postoperative pain scores, recovery time, and complications'.

Results: Patients in the laparoscopic group demonstrated lower postoperative pain scores, undertook oral intake sooner, had reduced duration of hospital stay, and resumed normal activities faster relative to patients in the open group. Even though the laparoscopic group took longer to complete the procedure, the additional time was compensated for by the improved recovery after surgery. Wound infection rates and intra-abdominal abscess formation were 'lower in the laparoscopic group but did not reach statistical significance'.

Conclusion: Laparoscopic appendectomy is a safe and effective approach for complicated appendicitis, offering better recovery and reduced postoperative discomfort. It should be considered the preferred surgical option when feasible and appropriately supported by surgical expertise.

Keywords: Complicated appendicitis, laparoscopic appendectomy, open surgery, postoperative outcomes, hospital stay, surgical site infection

INTRODUCTION

Acute appendicitis is still one of the most common surgical emergencies around the globe. Most cases are uncomplicated and easily managed; however, roughly 20-30% progress to complicated forms which include perforation, abscesses, or gangrene. These cases have higher rates of morbidity and require prompt and effective surgical treatment¹⁻³.

Due to a thorough understanding and better exposure, open appendectomy has, traditionally, been the preferred course of action, especially in complicated cases. With newer developments in surgical practices and tools, however, laparoscopic appendectomy has now become popular for both complicated and uncomplicated appendicitis. The laparoscopic method's benefits include less postoperative pain, smaller incisions, quicker return to normal activities, and reduced hospital stays⁴⁻⁶.

Regardless of the benefits, the use of laparoscopy in complicated appendicitis has raised some issues, especially with the increased length of operating time and the possibility of intra-abdominal abscesses developing. Other surgeons prefer open surgery for cases where there is marked inflammation or thick adhesions. Recent research, however, supports the notion that skilled laparoscopic surgeons can manage complicated cases safely, and laparoscopic appendectomy, with its proper technique, can be done with better results than traditional methods⁷⁻⁹.

Given the ongoing debate and the lack of consensus in many surgical settings, this study was undertaken 'to compare the outcomes of laparoscopic and open appendectomy in patients presenting with complicated

appendicitis'. The primary focus was on operative time, postoperative recovery, complications, and return to normal function. The results aim to contribute to evidence-based surgical decision-making in managing these challenging cases.

METHODOLOGY

This was a comparative observatory study conducted from November 2017 to November 2018 at the Department of General Surgery, Civil Hospital, Karachi. 'The objective of this study was to assess and compare the postoperative results in patients with complicated appendicitis and open versus laparoscopic appendectomies'.

The complete enrollment was done using a non-probability purposive sampling technique which resulted in a total of 79 patients with complicated appendicitis. This diagnosis of complicated appendicitis included perforation, gangrene, abscess, or localized mass which were confirmed either radiologically or intraoperatively.

Patients were split into two groups according to whether they 'had a laparoscopic appendectomy (n=39) or an open appendectomy (n=40)'. Each surgical technique was selected by the operating surgeon, using clinical reasoning alongside the resources on hand, taking into account the specific details of the patient's condition.

Inclusion Criteria:

- Patients aged 15 to 60 years
- Both genders
- Intraoperative confirmation of complicated appendicitis
- Patients who consented to participate

Exclusion Criteria:

- Patients with simple or uncomplicated appendicitis
- Known bleeding disorders or immunocompromised status
- Previous major abdominal surgery
- Patients who required simultaneous surgical procedures for other conditions

All surgeries were performed under general anesthesia by experienced surgeons. The laparoscopic group underwent three-port appendectomy with standard technique, including peritoneal lavage if required. In the open group, a right lower quadrant incision (modified McBurney or Lanz) was used. Postoperative care, including antibiotics, analgesia, and discharge protocols, was kept uniform to avoid bias.

A structured proforma was used to document demographic details, intraoperative findings, and postoperative outcomes. Key variables included operative time, intraoperative blood loss, wound infection, intra-abdominal abscess, postoperative pain (measured using a visual analog scale at 24 hours), time to oral intake, hospital stay, readmission, and return to normal activity.

All patients were monitored during their hospital stay, and follow-up was ensured up to 30 days postoperatively, either through outpatient visits or telephonic contact. Complications and recovery times were carefully recorded.

Statistical analysis was conducted using SPSS version 22. Quantitative variables like age, operative time, pain scores, and hospital stay were reported as mean \pm standard deviation. Categorical variables such as gender, type of complication, and postoperative infections were expressed in frequencies and percentages. 'Independent samples t-test was used to compare means, while Chi-square test or Fisher's exact test was applied for categorical data'. A p-value of less than 0.05 was considered statistically significant.

RESULT

The study included 79 patients diagnosed with complicated appendicitis, of whom 39 underwent laparoscopic appendectomy and 40 underwent open appendectomy. The mean age in the laparoscopic group was slightly lower (28.4 ± 6.7 years) compared to the open group (30.1 ± 7.4 years), 'though this difference was not statistically significant ($p = 0.251$) and the gender distribution was similar in both groups, with males comprising slightly over half in each'. The mean BMI was also comparable between the two groups (24.1 vs. 24.9 kg/m², $p = 0.371$). 'Comorbid conditions were present in 20.5% of the laparoscopic group and 25% of the open group, with no significant difference ($p = 0.624$)'.

Table 1: Demographic Characteristics

Variable	Laparoscopic (n=39)	Open (n=40)	p-value
Age (mean \pm SD)	28.4 ± 6.7	30.1 ± 7.4	0.251
Gender: Male	21 (53.8%)	22 (55.0%)	0.904
Gender: Female	18 (46.2%)	18 (45.0%)	0.904
BMI (mean \pm SD)	24.1 ± 3.8	24.9 ± 4.1	0.371
Comorbidities Present	8 (20.5%)	10 (25.0%)	0.624

The data indicates that laparoscopic appendectomy takes a significantly longer time to operate at (62.5 ± 12.6 minutes) when compared to open surgery which takes 48.8 ± 10.9 minutes ($p < 0.001$). The amount of perforated appendices and abscess cases were slightly more common in the open group, but not by a statistically relevant margin. Two patients (5.1%) required conversion from laparoscopic to open surgery. Blood loss was notably lower in the laparoscopic group (70.3 ± 22.1 ml) than in the open group (95.6 ± 25.4 ml), with a significant difference ($p < 0.001$).

Table 2: Operative and Intraoperative Variables

Variable	Laparoscopic (n=39)	Open (n=40)	p-value
Operative Time (minutes)	62.5 ± 12.6	48.8 ± 10.9	<0.001
Perforated Appendix	10 (25.6%)	14 (35.0%)	0.328
Appendicular Abscess	6 (15.4%)	7 (17.5%)	0.774
Conversion to Open	2 (5.1%)	-	-
Intraoperative Blood Loss (ml)	70.3 ± 22.1	95.6 ± 25.4	<0.001

Table 3: Postoperative Outcomes

Variable	Laparoscopic (n=39)	Open (n=40)	p-value
Pain Score (VAS) at 24h	3.1 ± 1.2	5.2 ± 1.5	<0.001
Time to Oral Intake (hours)	18.2 ± 4.3	27.4 ± 5.1	<0.001
Hospital Stay (days)	2.9 ± 1.1	4.8 ± 1.6	<0.001
Wound Infection	2 (5.1%)	7 (17.5%)	0.080
Intra-abdominal Abscess	1 (2.6%)	3 (7.5%)	0.306
Readmission	1 (2.6%)	4 (10.0%)	0.178
Return to Work (days)	8.7 ± 2.5	13.6 ± 3.2	<0.001

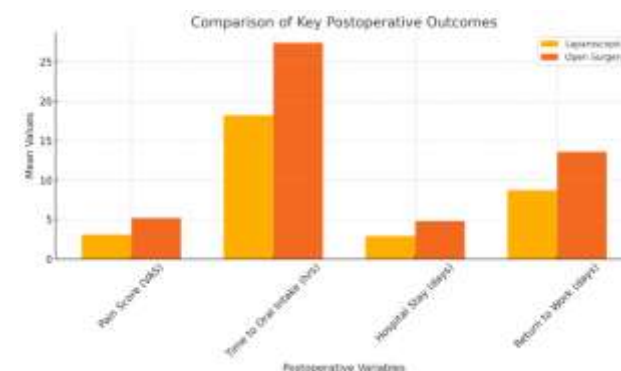


Figure 1: Figures illustrating the major postoperative outcomes in relation to laparoscopic or open appendectomy reveal that 'the laparoscopic group experienced less pain, returned to oral feeding more quickly, were discharged from the hospital sooner, and returned to work earlier than the open surgery subgroup'.

Postoperative pain was significantly less in the laparoscopic group, with a mean VAS score of 3.1 'compared to 5.2 in the open group ($p < 0.001$)'. Patients who underwent laparoscopic surgery resumed oral intake and mobilized earlier, with a shorter average hospital stay (2.9 vs. 4.8 days, $p < 0.001$). The incidence of wound infection was higher in the open group (17.5%) than in the

laparoscopic group (5.1%), though this was not statistically significant. Return to work was earlier in the laparoscopic group, averaging 8.7 days versus 13.6 days in the open group ($p < 0.001$).

DISCUSSION

This study aimed 'to evaluate and compare the outcomes of laparoscopic and open appendectomy in patients presenting with complicated appendicitis'. The findings highlight that laparoscopic surgery, despite being associated with a slightly longer operative time, offers several postoperative advantages including reduced pain, shorter hospital stay, quicker return to oral intake, and earlier resumption of routine activities.

One of the most prominent differences observed was in 'postoperative pain, which was significantly lower in the laparoscopic group'. This aligns with previous literature where minimally invasive approaches have been shown to result in less tissue trauma, thereby reducing pain scores and improving patient comfort. Studies similarly reported lower pain scores and reduced analgesic requirements in laparoscopic appendectomy, even in complicated cases¹⁰⁻¹².

Laparoscopic surgery patients also had a much shorter hospital stay, demonstrating this surgery's advantages. This finding was supported by other studies that demonstrated that early recovery, mobilization, and fewer postoperative complications contributed to reduced hospital stays in the laparoscopic group. Additionally, the time to oral intake was faster among laparoscopic patients, suggesting a quicker return of bowel function and reduced ileus, commonly reported benefits of minimally invasive surgery¹³⁻¹⁵.

While the laparoscopic group did have longer operative times, this discrepancy was rather anticipated. Laparoscopic procedures generally take more time, particularly in cases involving perforation, abscess, or adhesions. However, the improved postoperative recovery appears to outweigh the slightly extended operative duration^{16,17}.

Wound infection rates were 'lower in the laparoscopic group, although the difference was not statistically significant'. The trend still supports the notion that smaller incisions and less external tissue exposure in laparoscopy reduce the risk of surgical site infections. Similar trends have been reported in studies showing a lower incidence of wound complications in laparoscopic appendectomy^{18,19}.

The frequency of intra-abdominal abscesses and readmission did not differ significantly between the two groups, indicating that laparoscopy is as safe as open surgery in managing the intra-abdominal infectious burden in complicated cases. Some studies had earlier raised concerns regarding higher abscess formation following laparoscopy due to CO₂ insufflation, but recent evidence suggests that with proper technique and lavage, these risks are minimal²⁰.

Finally, the laparoscopic group had a marked improvement in the resumption of normal activities and work engagement. Alongside improving a patient's quality of life, this has sociocultural and economic benefits as well. Earlier return to work reduces the indirect costs of illness

and enhances productivity, an important consideration in resource-limited settings.

In general, the data from this study contributes to the existing evidence underscoring laparoscopic appendectomy as an adequate and safe procedure in cases of complicated appendicitis. While technical expertise and equipment availability remain limitations in some centers, the benefits in terms of recovery and patient satisfaction are compelling.

CONCLUSION

Laparoscopic appendectomy, although associated with a longer operative time, provides significant advantages in patients with complicated appendicitis, including less postoperative pain, shorter hospital stays, faster recovery, and lower infection rates. 'These findings support the wider adoption of laparoscopic techniques, even in complex cases, provided that surgical expertise and resources are available'. Open surgery remains a valid option when laparoscopy is contraindicated or unavailable, but minimally invasive surgery should be considered the preferred approach whenever feasible.

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