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Research Article

Comparing Laparoscopic Appendectomy versus Open Appendectomy for the Treatment of Acute Appendicitis: A Study of Complication Rates and Recovery Time

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Abstract

Background: Acute appendicitis is a common surgical emergency. The two primary surgical approaches are open appendectomy (OA) and laparoscopic appendectomy (LA). While LA is increasingly popular, its comparative benefits in terms of complication rates and recovery in a general surgery setting remain a key area of investigation.

Objective: To compare the postoperative complication rates and recovery times between laparoscopic and open appendectomy in patients with acute appendicitis.

Methods: A prospective comparative study was conducted over a 12-month period. Sixty patients diagnosed with acute appendicitis were allocated into two groups: Group A (n=30) underwent LA and Group B (n=30) underwent OA. Parameters assessed included intraoperative time, postoperative pain (using a Visual Analog Scale), time to resume oral diet, length of hospital stay (LOHS), and complication rates (including surgical site infection - SSI, intra-abdominal abscess, and ileus).

Results: The mean operating time was significantly longer in the LA group (58.3 ± 10.2 min) compared to the OA group (45.6 ± 8.7 min) ($p < 0.01$). However, the LA group demonstrated superior outcomes in recovery parameters: significantly lower postoperative pain scores at 24 hours (3.1 ± 0.8 vs. 5.8 ± 1.1, $p < 0.001$), earlier resumption of oral diet (18.2 ± 4.1 hours vs. 28.5 ± 6.3 hours, $p < 0.001$), and a shorter LOHS (2.1 ± 0.5 days vs. 3.8 ± 0.9 days, $p < 0.001$). The overall complication rate was lower in the LA group (10.0% vs. 30.0%, $p = 0.048$), driven primarily by a significant reduction in SSI (0% vs. 20%, $p = 0.01$).

Conclusion: Despite a longer operating time, laparoscopic appendectomy is associated with significantly fewer postoperative complications, notably surgical site infections, and a faster postoperative recovery compared to the open approach. LA should be considered the preferred surgical technique for uncomplicated acute appendicitis where resources and expertise are available.

Keywords: Appendicitis, Laparoscopic Appendectomy, Open Appendectomy, Surgical Site Infection, Recovery Time, Postoperative Complications.

Introduction

Acute appendicitis is one of the most prevalent causes of acute abdominal pain requiring surgical intervention worldwide [1]. The standard treatment for decades has been an open appendectomy (OA) via a right lower quadrant incision (McBurney's or Rocky-Davis), a procedure known for its efficacy and low complication rate in experienced hands [2].

With the advent of minimally invasive surgery, laparoscopic appendectomy (LA) has emerged as a viable alternative. First described in 1983, LA offers potential advantages including better cosmetic results, less postoperative pain, and a faster return to normal activities [3]. Proponents

argue that the laparoscopic approach provides superior visualization of the abdominal cavity, allowing for a more thorough diagnostic evaluation and irrigation, which may lead to lower rates of misdiagnosis and infectious complications [4].

However, the debate regarding the optimal surgical approach persists. Some studies suggest that LA is associated with a longer operating time and a potentially higher risk of intra-abdominal abscesses due to increased manipulation and higher insufflation pressures [5]. Furthermore, the choice of procedure can be influenced by the surgeon's expertise, hospital resources, and the patient's clinical presentation (e.g., perforated vs. non-perforated appendicitis).

This study aims to contribute to this ongoing discourse by prospectively comparing laparoscopic and open appendectomy in a controlled cohort of 60 patients, with a specific focus on postoperative complication rates and key recovery indicators.

Methods

Study Design and Population

1. A prospective comparative study was conducted at [Santosh Medical College & Hospital, Ghaziabad, Uttar Pradesh.] for 1 year. After obtaining ethical committee approval and informed consent, 60 consecutive patients diagnosed with acute appendicitis were enrolled. Diagnosis was based on clinical presentation, laboratory findings (leukocytosis), and radiological confirmation (Ultrasonography or CT scan).

Inclusion Criteria:

Patients aged 18-60 years with a clinical and radiological diagnosis of acute, uncomplicated appendicitis.

Exclusion Criteria:

Patients with generalized peritonitis, appendiceal mass or abscess, severe cardiopulmonary comorbidities, pregnancy, and those who declined to participate.

Group Allocation

Patients were allocated into two groups based on surgical scheduling and surgeon preference, aiming for equal distribution:

- **Group A (LA):** 30 patients undergoing laparoscopic appendectomy.
- **Group B (OA):** 30 patients undergoing open appendectomy.

Surgical Technique

All procedures were performed by experienced consultant surgeons proficient in both techniques under general anesthesia.

- **Laparoscopic Appendectomy:** A standard three-port technique was used (umbilical, suprapubic, and left lower quadrant). The appendix was dissected, its mesoappendix divided with a bipolar energy device, the base stapled with a linear stapler, and the specimen retrieved in a bag through the umbilical port.
- **Open Appendectomy:** A grid-iron incision was made over McBurney's point. The appendix was delivered, the mesoappendix ligated, the base transfixed and ligated, and the stump inverted. The wound was closed in layers.

Prophylactic antibiotics were administered to all patients preoperatively.

Data Collection and Outcome Measures

Data were collected on a pre-designed proforma.

- **Primary Outcomes:**
    - Complication Rate: Including surgical site infection (SSI), intra-abdominal abscess, postoperative ileus, and other morbidities within 30 days.
    - Recovery Time: Measured as Length of Hospital Stay (LOHS) in days.
- **Secondary Outcomes:**
    - Operative Time (skin incision to skin closure).
    - Postoperative Pain: Assessed using a Visual Analog Scale (VAS, 0-10) at 24 hours post-surgery.
    - Time to Resumption of Oral Diet (hours).

Statistical Analysis

Data were analyzed using SPSS software version 25.0. Quantitative data (e.g., age, operative time, LOHS) were expressed as mean ± standard deviation and compared using Student's t-test. Qualitative data (e.g., gender, complication rates) were expressed as percentages and compared using the Chi-square test or Fisher's exact test as appropriate. A p-value of < 0.05 was considered statistically significant.

Table 1: Baseline Demographic and Perioperative Characteristics

Characteristic	Laparoscopic Group (n=30)	Open Group (n=30)	p-value
Age (years), Mean ± SD	32.5 ± 9.8	34.1 ± 10.5	0.54

Characteristic	Laparoscopic Group (n=30)	Open Group (n=30)	p-value
Gender (Male), n (%)	17 (56.7%)	16 (53.3%)	0.80
Operative Time (min), Mean ± SD	58.3 ± 10.2	45.6 ± 8.7	**<0.01**

As detailed in **Table 1**, the two groups were comparable at baseline, with no statistically significant differences in age (LA: 32.5 ± 9.8 years vs. OA: 34.1 ± 10.5 years, p=0.54) or gender distribution (56.7% male vs. 53.3% male, p=0.80). However, a significant difference was observed in the mean operative time, with the LA procedure taking longer to perform than the OA procedure (58.3 ± 10.2 minutes vs. 45.6 ± 8.7 minutes, $p < 0.01$).

Table 2: Postoperative Recovery Outcomes

Outcome Measure	Laparoscopic Group (n=30)	Open Group (n=30)	p-value
Pain Score (VAS) at 24 hrs, Mean ± SD	3.1 ± 0.8	5.8 ± 1.1	**<0.001**
Time to Resume Diet (hours), Mean ± SD	18.2 ± 4.1	28.5 ± 6.3	**<0.001**
Length of Hospital Stay (days), Mean ± SD	2.1 ± 0.5	3.8 ± 0.9	**<0.001**

The analysis of postoperative recovery metrics, presented in Table 2, revealed consistently superior outcomes for the laparoscopic group. Patients who underwent LA reported significantly less pain at 24 hours post-surgery, with a mean Visual Analog Scale (VAS) score of 3.1 ± 0.8

compared to 5.8 ± 1.1 in the OA group ($p < 0.001$). Furthermore, recovery of gastrointestinal function was faster in the LA group, as evidenced by an earlier resumption of oral intake (18.2 ± 4.1 hours vs. 28.5 ± 6.3 hours, $p < 0.001$). These advantages culminated in a significantly shorter mean length of hospital stay for the LA group (2.1 ± 0.5 days) compared to the OA group (3.8 ± 0.9 days, $p < 0.001$).

Table 3: Postoperative Complication Rates

Complication Type	Laparoscopic Group (n=30)	Open Group (n=30)	p-value
Surgical Site Infection (SSI), n (%)	0 (0%)	6 (20.0%)	**0.01***
Intra-abdominal Abscess, n (%)	1 (3.3%)	1 (3.3%)	1.00
Postoperative Ileus, n (%)	2 (6.7%)	2 (6.7%)	1.00
Overall Complications, n (%)	3 (10.0%)	9 (30.0%)	**0.048**

A comparison of postoperative complications is summarized in

Table 3. The overall complication rate was significantly lower in the LA group (10.0%) than in the OA group (30.0%, $p=0.048$). This difference was largely driven by the incidence of surgical site infections (SSI), which occurred in none of the LA patients (0%) but in 6 patients (20.0%) in the OA group ($p=0.01$). The rates of other complications, including intra-abdominal abscess (LA: 3.3% vs. OA: 3.3%) and postoperative ileus (LA: 6.7% vs. OA: 6.7%), were identical between the two groups.

Discussion

This prospective comparative study demonstrates that within our cohort of 60 patients, laparoscopic appendectomy (LA) offers distinct advantages over the conventional open approach (OA) for the treatment of acute uncomplicated appendicitis, despite a longer initial operative time. Our findings contribute to the growing body of evidence that positions LA as the superior technique in terms of enhancing patient recovery and minimizing specific postoperative morbidities.

The most compelling finding of our study was the significant reduction in surgical site infections (SSI) with the laparoscopic approach. We observed a 0% SSI rate in the LA group compared to 20% in the OA group. This is a clinically vital outcome, as SSIs are a primary source of patient morbidity, increase antibiotic usage, and elevate healthcare costs. This result aligns robustly with a large meta-analysis by **Sauerland et al. (2010)** published in the Cochrane Database of Systematic Reviews, which synthesized data from numerous randomized controlled trials. Their conclusion that LA reduces the risk of overall wound infections by approximately 60% compared to OA provides a strong external validation for our findings [6]. The mechanism behind this benefit is likely multifactorial, involving smaller incisions remote from the primary site of inflammation, minimal tissue handling, and the extraction of the infected appendix through a trocar, thereby avoiding direct contamination of the wound edges.

Beyond infectious complications, our data clearly illustrate a faster and more comfortable postoperative course for patients undergoing LA. The significantly lower pain scores, earlier resumption of diet, and consequent reduction in hospital stay collectively paint a picture of enhanced recovery. This is a consistent theme in the literature. For instance, a meta-analysis by **Li**

et al. (2010) in BMC Gastroenterology confirmed that LA is associated with less postoperative pain, a shorter time to return to normal activity, and a reduced length of hospital stay [7]. The physiological basis for this is rooted in the principles of minimally invasive surgery: smaller incisions cause less trauma to the abdominal wall musculature, leading to diminished pain and facilitating earlier ambulation, which in turn promotes the return of gastrointestinal function.

It is important to address the two principal counterpoints to the laparoscopic approach: operative duration and the risk of intra-abdominal abscess. Our study confirmed that LA requires a longer operative time, a finding consistently reported in the literature and often attributed to the setup of laparoscopic equipment and the learning curve of intracorporeal techniques [6, 7]. However, we argue that this initial time investment is offset by the downstream benefits of a faster recovery and fewer complications. Furthermore, contrary to some early concerns that increased manipulation and higher insufflation pressures might elevate the risk of deep intra-abdominal sepsis, we found no such increase. The rate of intra-abdominal abscess was identical (3.3%) in both groups. This finding is supported by more recent literature, such as the work of **Wei et al. (2011)**, which concluded that with modern surgical techniques and adequate peritoneal irrigation, the risk of intra-abdominal abscess is comparable between LA and OA [5]. This suggests that the theoretical risk does not translate into a clinical reality in the hands of experienced surgeons.

Conclusion

In summary, the results of our investigation strongly support the use of laparoscopic appendectomy as the preferred technique for managing acute uncomplicated appendicitis. The laparoscopic approach, despite a longer operating time, provides tangible patient-centered benefits, including a markedly lower risk of wound infection, less postoperative pain, and a significantly faster return to normal function leading to a shorter hospital stay. These advantages, which are consistent with

the findings of major meta-analyses and contemporary literature, justify the position of LA as the procedure of choice in settings where the necessary equipment and surgical proficiency are available.

References

1. Addiss DG, Shaffer N, Fowler BS, Tauxe RV. The epidemiology of appendicitis and appendectomy in the United States. Am J Epidemiol. 1990 Nov;132(5):910–25. PMID: 2239906.

2. Chung RS, Rowland DY, Li P, Diaz J. A meta-analysis of randomized controlled trials of laparoscopic versus conventional appendectomy. Am J Surg. 1999 Mar;177(3):250–6. DOI: 10.1016/s0002-9610(99)00027-3. PMID: 10219865.

3. Semm K. Endoscopic appendectomy. Endoscopy. 1983 Feb;15(2):59–64. DOI: 10.1055/s-2007-1021466. PMID: 6221925.

4. Jaschinski T, Mosch CG, Eikermann M, Neugebauer EA, Sauerland S. Laparoscopic versus open surgery for suspected appendicitis. Cochrane Database Syst Rev. 2014 Nov 28;11(11):CD001546. DOI: 10.1002/14651858.CD001546.pub4. PMID: 30484855.

5. Wei B, Qi CL, Chen TF, Zheng ZH, Huang JL, Hu BG, et al. Laparoscopic versus open appendectomy for acute appendicitis: a metaanalysis. Surg Endosc. 2011 Apr;25(4):1199–208. DOI: 10.1007/s00464-010-1344-z. PMID: 20872075.

6. Sauerland S, Jaschinski T, Neugebauer EA. Laparoscopic versus open surgery for suspected appendicitis. Cochrane Database Syst Rev. 2010 Oct 6;(10):CD001546. DOI: 10.1002/14651858.CD001546.pub3. PMID: 20927725.

7. Li X, Zhang J, Sang L, Zhang W, Chu Z, Li X, et al. Laparoscopic versus conventional appendectomy--a meta-analysis of randomized controlled trials. BMC Gastroenterol. 2010 Nov 24;10:129. DOI: 10.1186/1471-230X-10-129. PMID: 21108832.

8. Yu MC, Feng YJ, Wang W, Fan W, Cheng HT, Xu J. Is laparoscopic appendectomy feasible for complicated appendicitis ?A systematic review and meta-analysis. Int J Surg. 20155 Apr;40:187–97. DOI: 10.1016/j.ijsu.2015.03.022. PMID: 28302448.