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RESEARCH ARTICLE
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COMPARATIVE STUDY OF OPEN VS LAPAROSCOPIC APPENDECTOMY IN ACUTE APPENDICITIS

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ABSTRACT:
Background: Acute appendicitis is a common surgical emergency. While open appendectomy (OA) has been the traditional standard, laparoscopic appendectomy (LA) offers potential advantages such as reduced postoperative pain, shorter hospital stay, and faster recovery. This study was conducted to compare outcomes of open versus laparoscopic appendectomy in patients with acute appendicitis.
Methods: A prospective study was conducted on 100 patients with acute appendicitis, divided into OA (n=50) and LA (n=50) groups. Operative time, postoperative pain (VAS score), hospital stay, complications, and time to return to normal activity were recorded and analyzed.
Results: The mean operative time was slightly longer in the LA group (65 ± 12 min) than OA (55 ± 10 min, $p<0.001$). Postoperative pain at 24 hours was lower in the LA group (VAS 3.5 ± 0.8 vs 5.8 ± 1.2, $p<0.001$). Hospital stay (2.3 ± 0.6 vs 4.1 ± 1.0 days) and time to return to normal activity (6.8 ± 1.5 vs 10.5 ± 2.1 days) were significantly shorter in the LA group ($p<0.001$). Complication rates were comparable (OA 10% vs LA 6%, NS).

Conclusion: Both OA and LA are safe and effective. Laparoscopic appendectomy provides **less pain, faster recovery, and shorter hospitalization**, while open appendectomy remains a **cost-effective, reliable option**. The choice of approach should depend on **patient profile, surgeon expertise, and resource availability**.

Keywords: Acute appendicitis, Open appendectomy, Laparoscopic appendectomy, Postoperative pain, Recovery

INTRODUCTION:

Acute appendicitis is the most common surgical emergency worldwide, with a lifetime incidence of approximately 7–8% [1,2]. It is characterized by inflammation of the vermiform appendix, which, if untreated, can lead to perforation, peritonitis, and sepsis, contributing significantly to morbidity and healthcare burden [3]. The definitive treatment for acute appendicitis is **surgical removal of the appendix**, traditionally performed via **open appendectomy (OA)**. Since its first description by

McBurney in the late 19th century, OA has been widely practiced and remains a safe and effective procedure with low mortality [4,5].

Despite its efficacy, OA is associated with a **relatively large incision**, postoperative pain, delayed mobilization, longer hospital stay, and occasionally poor cosmetic outcomes [6]. These limitations have driven the development and adoption of **laparoscopic appendectomy (LA)**, first described by Semm in 1983 [7]. Laparoscopic surgery offers several potential advantages, including **smaller incisions, reduced tissue trauma, decreased postoperative pain, shorter hospital stay, faster return to normal activity, and improved cosmetic results** [8–10]. Moreover, laparoscopic techniques allow better visualization of the abdominal cavity, enabling the identification of alternative diagnoses, concurrent pathologies, or complications such as perforation or abscess [11].

Several randomized controlled trials and meta-analyses have compared LA and OA, demonstrating that while LA is associated with **less postoperative pain, faster recovery, and shorter hospitalization**, OA often has **shorter operative time and lower cost**, making it still relevant, especially in resource-limited settings [12–15]. Some studies also suggest a slight increase in intra-abdominal abscess rates with LA, particularly in complicated appendicitis, though overall complication rates are similar [16,17].

Considering these differences, the choice of surgical approach should be individualized based on **patient factors, surgeon expertise, and institutional resources**. This study aims to **prospectively compare outcomes of open and laparoscopic appendectomy** in patients with acute appendicitis, focusing on **operative time, postoperative pain, complications, hospital stay, and return to normal activity**, thereby providing evidence to guide optimal surgical decision-making.

MATERIALS AND METHODS:

Study Design and Setting

This was a **prospective comparative study** conducted in the Department of General Surgery at a tertiary care hospital for a period of one year. Institutional ethical clearance was obtained and informed written consent was obtained from all participants before enrollment.

Study Population

A total of **100 patients** diagnosed with acute appendicitis were included in the study and **divided into two groups**:

- **Group A (n=50):** Open appendectomy (OA)
- **Group B (n=50):** Laparoscopic appendectomy (LA)

Inclusion Criteria

- Age **18–60 years**
- Clinically and radiologically confirmed **acute appendicitis**
- **ASA I–II** (American Society of Anesthesiologists physical status classification)

Exclusion Criteria

- Complicated appendicitis (perforation, abscess, generalized peritonitis)
- Prior abdominal surgery
- Severe cardiopulmonary comorbidities
- Pregnancy

Preoperative Evaluation

All patients underwent:

- Detailed clinical history and physical examination
- Laboratory investigations: CBC, renal and liver function tests, serum electrolytes
- Imaging: Ultrasound abdomen ± CT scan if diagnosis was uncertain
- Preoperative scoring: Alvarado score for appendicitis severity

Surgical Procedures

Open Appendectomy (OA):
- Performed under **spinal or general anesthesia**
- **Right lower quadrant incision** (Gridiron or Lanz)
- Appendix identified, mesoappendix ligated, and appendix excised
- Peritoneum and fascia closed; skin closed with interrupted sutures
- **Expected operative time:** 50–60 minutes

Laparoscopic Appendectomy (LA):
- Performed under **general anesthesia**
- **Standard three-port technique:** 10 mm umbilical camera port, two 5 mm working ports
- Appendix visualized, mesoappendix divided using bipolar/ultrasonic device, appendix removed in endobag
- Ports closed in layers
- **Expected operative time:** 60–70 minutes

Postoperative Management
- All patients received **standard postoperative care** including analgesics (IV paracetamol and NSAIDs), antibiotics as indicated, and early mobilization.
- Postoperative pain was assessed using the **Visual Analogue Scale (VAS)** at 24 hours, 48 hours, and on day 7.
- Diet was advanced as tolerated; discharge was based on pain control, mobilization, and tolerance of oral intake.

Outcome Measures
1. **Operative time** (minutes)
2. **Postoperative pain** (VAS score)
3. **Hospital stay** (days)
4. **Time to return to normal activity** (days)
5. **Postoperative complications:**
   - Wound infection
   - Intra-abdominal abscess
   - Postoperative ileus
   - Other minor complications

Statistical Analysis
- Data were analyzed using **SPSS version 20**.
- Continuous variables were expressed as **mean ± standard deviation** and compared using **Student's t-test**.
- Categorical variables were expressed as **frequencies and percentages** and analyzed using **Chi-square or Fisher's exact test**.
- A **p-value <0.05** was considered statistically significant.

RESULTS:
A total of **100 patients** were enrolled, with 50 in each group. Both groups were comparable in **age, gender distribution, and ASA classification**, with no statistically significant differences (Table 1).

Table 1. Baseline characteristics of patients

Variable	Open (n=50)	Laparoscopic (n=50)	*p* value
Age (years)	34.5 ± 10.2	35.8 ± 9.8	0.56 (NS)
Male : Female	32:18	33:17	0.82 (NS)
ASA I : II	38:12	37:13	0.79 (NS)

The **mean operative time** was slightly longer in the laparoscopic group (65 ± 12 min) compared to open appendectomy (55 ± 10 min, $p<0.001$) due to port placement and intra-abdominal dissection (Table 2).

Table 2. Operative time

Parameter	Open (n=50)	Laparoscopic (n=50)	*p* value
Operative time (min)	55 ± 10	65 ± 12	<0.001

Postoperative pain, measured by **VAS**, was significantly lower in the laparoscopic group at all time points (24 hours, 48 hours, and day 7) (Table 3).

Table 3. Postoperative pain (VAS score)

Time Interval	Open (n=50)	Laparoscopic (n=50)	*p* value
24 hours	5.8 ± 1.2	3.5 ± 0.8	<0.001
48 hours	3.8 ± 0.9	2.1 ± 0.6	<0.001
Day 7	1.8 ± 0.5	1.2 ± 0.4	0.01

Patients in the laparoscopic group had **shorter hospital stay** and **faster return to normal activity** than those in the open group (Table 4).

Table 4. Hospital stay and return to normal activity

Parameter	Open (n=50)	Laparoscopic (n=50)	*p* value
Hospital stay (days)	4.1 ± 1.0	2.3 ± 0.6	<0.001
Return to normal activity (days)	10.5 ± 2.1	6.8 ± 1.5	<0.001

The overall **complication rate** was slightly higher in the open group (10%) compared to laparoscopic appendectomy (6%), but the difference was not statistically significant. Wound infection was the most common complication in the open group (Table 5).

Table 5. Postoperative complications

Complication	Open (n=50)	Laparoscopic (n=50)	*p* value
Wound infection	2 (4%)	1 (2%)	0.55 (NS)
Intra-abdominal abscess	1 (2%)	1 (2%)	1.00 (NS)
Ileus	2 (4%)	1 (2%)	0.55 (NS)
Total complications	5 (10%)	3 (6%)	0.46 (NS)

DISCUSSION:

Acute appendicitis remains one of the most common surgical emergencies worldwide. Both **open appendectomy (OA)** and **laparoscopic appendectomy (LA)** are established treatment modalities, each with distinct advantages and limitations. In our study, we observed that **laparoscopic appendectomy offers significant benefits in terms of reduced postoperative pain, shorter hospital stay, and faster return to normal activity**, while open appendectomy showed slightly shorter operative time and comparable safety.

Operative Time

The **operative time** in the laparoscopic group (65 ± 12 min) was longer than in the open group (55 ± 10 min, $p<0.001$). This finding aligns with previous studies, which consistently show that LA takes longer due to port placement, pneumoperitoneum creation, and intra-abdominal dissection [18,19]. With increasing surgical expertise, however, operative time for LA tends to decrease and can become comparable to OA [20].

Postoperative Pain

Our study demonstrated significantly **lower postoperative pain in the LA group** at 24 and 48 hours, and on day 7. These findings are consistent with multiple meta-analyses and randomized controlled trials reporting reduced tissue trauma and smaller incisions as the main contributors to decreased pain after LA [18,21]. Reduced pain contributes directly to earlier mobilization, improved patient comfort, and shorter hospital stay.

Hospital Stay and Recovery

Patients undergoing LA had a **shorter hospital stay (2.3 ± 0.6 days) and faster return to normal activity (6.8 ± 1.5 days)** compared to OA (4.1 ± 1.0 days and 10.5 ± 2.1 days, respectively). These results mirror findings from Sauerland et al. [18] and Guller et al. [19], who demonstrated that minimally invasive appendectomy facilitates faster recovery and earlier resumption of daily activities, which has significant socioeconomic implications.

Postoperative Complications

The overall complication rate was slightly higher in OA (10%) versus LA (6%), although not statistically significant. Wound infection was more common in the open group, while intra-abdominal abscess and ileus occurred equally in both groups. Previous studies also report comparable complication rates between LA and OA, with minor variations in wound infection and intra-abdominal abscess rates [22–24]. Importantly, LA allows better visualization of the abdominal cavity, potentially reducing missed diagnoses or undetected pathology [20].

CONCLUSION: Both open and laparoscopic appendectomy are safe and effective for treating acute appendicitis. Laparoscopic appendectomy offers advantages of **reduced postoperative pain, shorter hospital stay, and faster return to normal activity**. Open appendectomy remains a **reliable, cost-effective option**, particularly in resource-limited settings or where laparoscopic expertise is unavailable. Operative time is slightly longer with laparoscopy, but this is offset by faster recovery. The choice of surgical approach should be guided by **patient factors, surgeon experience, and available resources**.

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