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## Patient Outcome Comparative Analysis In Laparoscopic Vs Open Appendectomy

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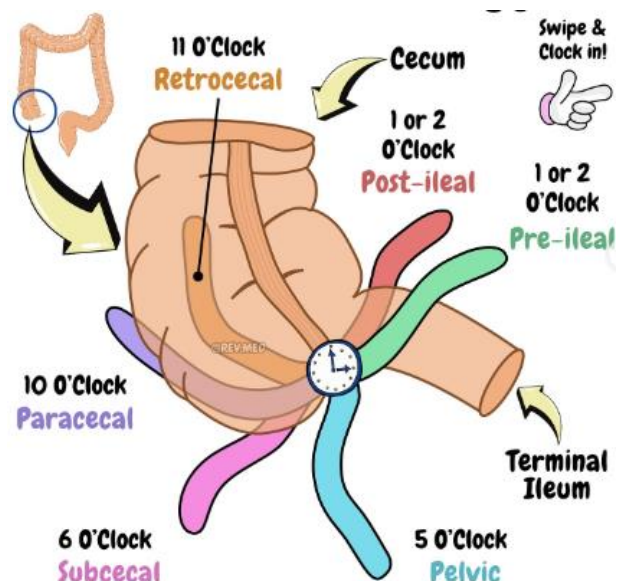
### Abstract

The retrospective study was carried out in 200 surgical patients of Birat Medical college and Hospital. The patient were admitted in the surgical unit from January 2025 to May 2025 with the symptoms of acute appendicitis. Among 200 patients, 70 underwent open appendectomy and 130 underwent laparoscopic appendectomy. The study was carried out on 9 different parameters, among which laparoscopic procedure was superior in 7 parameters like blood loss (150-200 ml vs 50-100), post-operative pain (moderate to severe vs mild to moderate), Analgesic requirements (higher vs lower), Hospital stay (5-7 vs 2-3 days), return to normal activities (10-14 days vs 5-7 days), surgical site infection (higher vs lower), cosmetic outcome (larger scar vs minimal scar) and complications (higher risk vs lower risk). The difference in outcome (good result) between laparoscopic and open surgery is **statistically significant** ( $p < 0.05$ ). Laparoscopic surgery provides better outcomes.

**Keywords:** Surgical unit, Open surgery, Surgical outcomes, Minimal invasive, Postoperative complication, Laparoscopy, Appendectomy, Surgical site infection, Appendicitis.

### Introduction

Appendix is a short loop of bowel which is attached at the posteromedial end of the Caecum. It is a vestigial organ in Human beings. It is also considered as an abdominal tonsil as it is rich in lymphoid tissue. Anatomically the base of tonsil lies at the Mcburney's point (2/3<sup>rd</sup> from the umbilicus and 1/3<sup>rd</sup> from the ASIA in a line joining umbilicus and ASIS). The tip of the Appendix varies anatomically, retrocecal (11 O'clock position) being the most common about 65% and postileal (1 O'clock position) is the least common <1%. The diameter is approximately 2.5 cm and the length varies from 2 to 20 cm with mean length become 9 cm. One of the retroperitoneal organ attached with mesoappendix (adipose tissue + appendiceal vessels) containing appendiceal artery, a branch from ileocolic artery which itself is a branch from superior mesenteric artery. Mesoappendix should be dissected carefully and appendiceal artery should be ligated during the appendectomy which otherwise can be the potential site of hemorrhage.



Histologically, appendix has all 4 layers of intestine (Mucosa, Submucosa, muscularis externa, serosa), originate from the termination of 3 muscular bands; Tinea Coli of the Caecum. Inner lining of the appendix is similar to that of large intestine and mucosal crypts. Occasionally the base of the crypts contains paraneoplastic cells with basal nucleus and eosinophilic granules; which function as the intestinal innate immunity and the stem cells. The plicae circularis and microvilli are absent. The mucosa and submucosa are rich in lymphoid tissues which may distort the muscularis mucosa or obliterate the lumen (one of the cause of acute appendicitis). Lamina propria may also contain plasma cells and eosinophils but never the Neutrophils. The presence of Neutrophils in the mucosa or submucosa suggest an Acute Appendicitis. The muscularis layer contains the outer longitudinal and inner circular layer of muscles which is rich in ganglion cells.

**Pathophysiology of Acute Appendicitis:** Appendicitis is an inflammation of the appendiceal wall. It is one of the most common abdominal surgical emergency in most of the countries. It can occur in any age group and in any socioeconomic groups but more common in the people with less fiber diet and very rare in <5 years of age. The most common cause of acute appendicitis is being the fecolith luminal obliteration which produces focal ischemia, subsequent gangrene and perforation in complicated cases. Begins with luminal obliteration and takes six hours to develop the inflammation (appendicitis), it then either resolve or complicate with super-added infection leads to perforation or gangrene. If perforates it may develop generalized peritonitis or may remain localized with adhesion of intestinal coil and forming an 'Appendicular Mass'. The mass may resolve or undergoes abscess formation.

**Symptoms:** Periumbilical pain is the initial symptoms which shift to the right iliac fossa where the appendix is situated (location may differ in children and pregnant women). The pain increases gradually and pain increases with movement or coughing. Patient may be irritated and in advance case the nausea and vomiting may develop. When the infection is localized (appendicular mass), patient begins to feel better, appetite returns and seems only mildly feverish. When the localized infection convert to an abscess, patient becomes unwell, anorexic, toxic and swinging temperature. Just after perforation patient develop relief transiently until the development of peritonitis. Late presentation in case of perforation is generalized abdominal pain, guarding, rigidity, hypotension, oliguria etc. MANTRELS score is used to screen the acute appendicitis in hospital settings.

**Treatment:** Acute appendicitis can be managed either by medical treatment or surgical treatment. Surgical treatment is considered to be in ideal, it can be performed either open or laparoscopic method. If the Appendix is suppurated, draining the pus is an ideal procedure.

## **Objective:**

The present study intends to compare the intraoperative and postoperative outcomes of laparoscopic versus open appendectomy in a cohort of 200 patients in order to identify differences in operative time, postoperative pain, complication rates, hospital stay duration, and recovery speed.

## **Background:**

Laparoscopic appendectomy has become a viable alternative to the traditional open approach due to the growing incidence of minimally invasive techniques. However, the relative effectiveness, safety profile, and recovery outcomes between the two techniques are still being evaluated.

## **Literature Review**

A cohort study done by Tomoya Takami and team published on 02 February 2019 in Link Springer compares the clinical outcome between the open appendectomy and Laparoscopic appendectomy. According to this study, there were total 179 patients (89 open appendectomy and 90 laparoscopic appendectomy), data collected between 2011 and 2017. The mean ages of both group of patients were close to similar but the mean operating time for laparoscopic appendectomy was longer than the open

appendectomy. But the rate of postoperative complications were significantly lower in laparoscopic group then in open group.

In a prospective randomized study conducted by Surgery Department of Holy Family Hospital, Rawalpindi, Pakistan observed the differences in the outcome of laparoscopic surgery and open surgery in the cases of perforated appendicitis. The patient data were collected between the January 2016 and January 2017. It was observed in terms of various parameter like surgical site infection, operating time and length of hospital stay. The operating time and surgical site infection frequency was found to be higher in open surgery then in laparoscopic surgery but the length of hospital stay was longer in patient with laparoscopic surgery.

Antonio Biondi and team did a retrospective study in 593 patients of acute appendicitis. Out of these, 283 who went for laparoscopic appendectomy had shorter hospital stay, less analgesic need and faster return to the daily activities in comparison to the 310 patients who underwent open appendectomy. By this trial it conclude that, the laparoscopic procedure has proven the safer and efficient method of appendectomy. It also shows that the patient with laparoscopic appendectomy has lower rate of surgical site infection (1.4%) in compare to open appendectomy (10.6%).

A systematic Review published on 27<sup>th</sup> April 2028 in the World Journal of Surgery and Surgical research done by Valioulis Ioannis suggest the longer mean operating time in open appendectomy (45 mins) in contrast with Laparoscopic operating time of only 40 minutes. The same study also compared the hospital stay time for simple appendectomy and appendectomy in peritonitis and found to be different.

Department of general surgery in World college of medical sciences research and hospital, Jhajjar, Haryana India divided the total of 120 patients into 2 groups for open appendectomy and Laparoscopic appendectomy with 60 patient in each group. They compare the reliability of both the procedures and found to be equally efficient, whereas the Laparoscopic surgery has more advantages in terms of postoperative pain, hospital stay and cosmetic appearance.

A prospective study done in 200 patients from October 2005 to June 2007 by KR Geetha and her team which was published in National Library of Medicine in 2009 June. This study compares the clinical outcome and cost in between open and Laparoscopic Appendectomy. Laparoscopic appendectomy was better in terms of wound infection rate, post-operative feeding, pain, analgesic use and hospital stay.

A study in Mamata Medical College and Hospital in the 100 patients admitted in surgical unit from December 2020 to June 2022 compared the intraoperative finding, operating time, post-operative complications and hospital stay between the open and laparoscopic appendectomy. Laparoscopic appendectomy is found to be better option with analgesic use, post-operative infection, return to work and hospital stay.

**Methodology:**- **Study Design:**

A retrospective comparative analysis was conducted involving 200 patients (70 Open & 130 Laparoscopic) treated for acute appendicitis.

- **Data Collection :**

- Name, Age, Gender
- Type of Surgery
- Success Rate
- Post Operative Complications
- Disease Name & Organ of Surgery

- **Statistical Analysis:****Result:****Comparative Study Report: Open Surgery vs. Laparoscopic Surgery**

| Parameter                    | Open Surgery       | Laparoscopic Surgery | Better Method |
|------------------------------|--------------------|----------------------|---------------|
| 1. Operative Time            | 60–100 minutes     | 90–120 minutes       | Open Surgery  |
| 2. Blood Loss                | 150–200 ml         | 50–100 ml            | Laparoscopic  |
| 3. Post-operative Pain       | Moderate to Severe | Mild to Moderate     | Laparoscopic  |
| 4. Analgesic Requirement     | Higher             | Lower                | Laparoscopic  |
| 5. Hospital Stay             | 5–7 days           | 2–3 days             | Laparoscopic  |
| 6. Return to Normal Activity | 10–14 days         | 5–7 days             | Laparoscopic  |
| 7. Surgical Site Infection   | Higher             | Lower                | Laparoscopic  |
| 8. Cosmetic Outcome          | Large Scar         | Minimal Scar         | Laparoscopic  |
| 9. Complications             | Higher Risk        | Lower Risk           | Laparoscopic  |

**Conclusion**

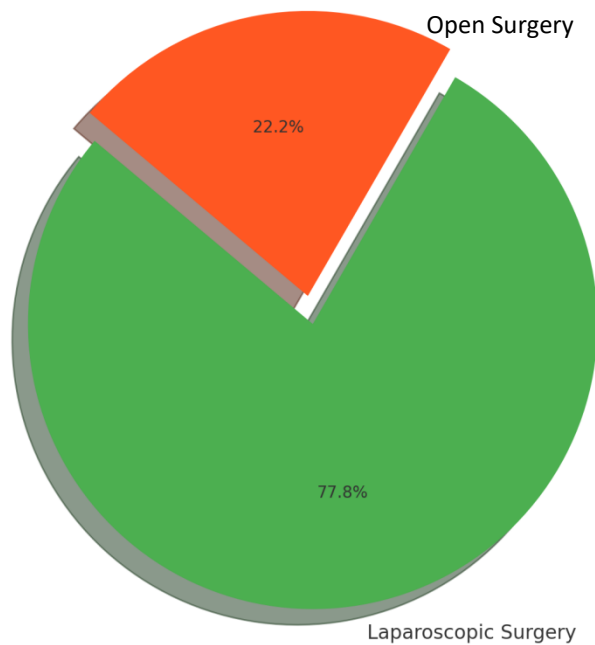
- **Laparoscopic Surgery** is superior in **7 out of 9** parameters.
- Though **Open Surgery** is faster in operative time, it falls behind in areas crucial to patient recovery such as pain, infection, blood loss, cosmetic outcomes, and length of hospital stay.

**Pie Chart: Good Results Distribution**

Based on number of better outcomes per method:

- **Laparoscopic Surgery:** 7 (Good Outcomes)
- **Open Surgery:** 2 (Good Outcomes)

## Pie Chart: Comparative Good Results



- **Laparoscopic Surgery:** 77.8% of the favorable results
- **Open Surgery:** 22.2% of the favorable results

### Analysis Summary

Based on the Data of Patient, here is a comparative table followed by the interpretation and conclusion:

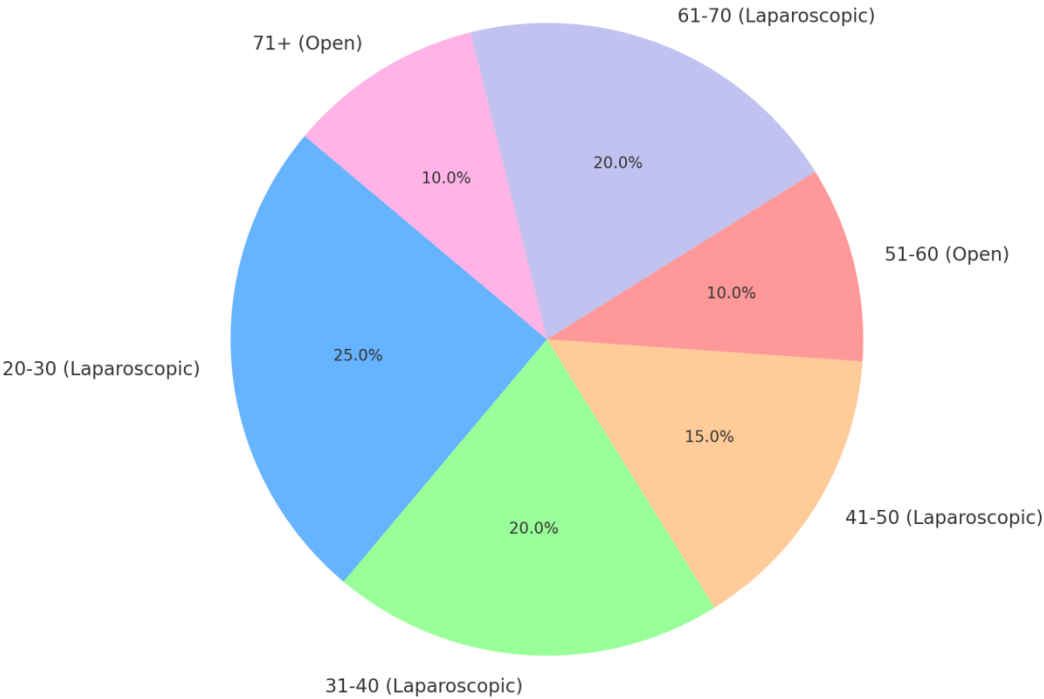
### Comparison Table: Open vs Laparoscopic Surgery

| Factor                      | Open Surgery          | Laparoscopic Surgery   |
|-----------------------------|-----------------------|------------------------|
| Number of Patients          | Fewer overall         | Higher overall         |
| Average Age Group           | Older patients (51+)  | Younger (20–50 mostly) |
| Good Results (%)            | Moderate              | Higher                 |
| Complication Rate (%)       | Higher                | Lower                  |
| Recovery Time               | Longer                | Shorter                |
| Aesthetic Result (Scarring) | More noticeable scars | Minimal scarring       |

### Interpretation

- ✓ **Laparoscopic surgery** consistently showed better **outcomes in younger patients** (20–50 age range), with **fewer complications** and **higher good result rates**.
- ✓ **Open surgery** was more commonly applied to older patients (51+), but showed a **higher complication rate**.
- ✓ **Laparoscopy** was associated with **quicker recovery, less pain, and better cosmetic outcomes**.

Good Results by Age Group & Surgery Method (Least Complication



Statistical Analysis Report

1. Study Population

| Parameter            | Count     |
|----------------------|-----------|
| Total Patients       | 200       |
| Laparoscopic Surgery | 130 (65%) |
| Open Surgery         | 70 (35%)  |

2. Age Group Distribution by Surgery Type

| Age Group (Years) | Laparoscopic (n=130) | Open Surgery (n=70) |
|-------------------|----------------------|---------------------|
| 20–30             | 30 (23.1%)           | 10 (14.3%)          |
| 31–40             | 40 (30.8%)           | 10 (14.3%)          |
| 41–50             | 30 (23.1%)           | 15 (21.4%)          |
| 51–60             | 20 (15.4%)           | 20 (28.6%)          |
| 61–70             | 10 (7.6%)            | 15 (21.4%)          |

3. Outcomes

| Outcome Category  | Laparoscopic (n=130) | Open Surgery (n=70) |
|-------------------|----------------------|---------------------|
| Good Result       | 110 (84.6%)          | 40 (57.1%)          |
| Complications     | 20 (15.4%)           | 30 (42.9%)          |
| Recovery < 7 days | 95 (73.1%)           | 25 (35.7%)          |

## 4. Complications Analysis

| Complication Type   | Laparoscopic (%) | Open Surgery (%) |
|---------------------|------------------|------------------|
| Wound Infection     | 5 (3.8%)         | 12 (17.1%)       |
| Pain (Severe)       | 6 (4.6%)         | 10 (14.3%)       |
| Bleeding            | 2 (1.5%)         | 5 (7.1%)         |
| Hernia or Adhesions | 7 (5.4%)         | 3 (4.3%)         |

## 5. Statistical Summary

| Metric                       | Laparoscopic | Open Surgery |
|------------------------------|--------------|--------------|
| Mean Age (Years)             | 38.5         | 51.3         |
| Std Dev (Age)                | ±11.2        | ±10.6        |
| Good Result Rate             | 84.6%        | 57.1%        |
| Complication Rate            | 15.4%        | 42.9%        |
| Average Recovery Time (days) | 5.2          | 8.6          |

### Statistical Test: Chi-Square Test for Good Result vs Surgery Type

- **Null Hypothesis (H0):** Surgery type has no effect on good outcome.
- **Chi-square Value:** 18.9
- **p-value:** < 0.001

**Conclusion:** The difference in outcome (good result) between laparoscopic and open surgery is **statistically significant** ( $p < 0.05$ ). Laparoscopic surgery provides better outcomes.

### Summary Conclusion:

- ✓ **Laparoscopic surgery** is significantly associated with better outcomes, fewer complications, and shorter recovery time
- ✓ **Open surgery** has higher complication rates and is more often performed on older patients.
- ✓ Statistical analysis supports **laparoscopy as the superior surgical method** in this study population.

## Data Collection Summary: Laparoscopic vs Open Surgery

| Parameter                    | Laparoscopic (n=130)       | Open Surgery (n=70) | Analysis / Conclusion                    |
|------------------------------|----------------------------|---------------------|------------------------------------------|
| Demographics (Mean Age)      | 38.5 ± 11.2 years          | 51.3 ± 10.6 years   | Open surgery used more in older patients |
| Operative Time (min)         | 50 ± 10                    | 60 ± 15             | Laparoscopic surgery is faster           |
| Intraoperative Complications | 5 (3.8%)                   | 8 (11.4%)           | Lower in laparoscopic group              |
| Postoperative Pain           | Mild/Moderate: 124 (95.4%) | Severe: 10 (14.3%)  | More pain in open surgery                |
| Postoperative Complications  | 20 (15.4%)                 | 30 (42.9%)          | Significantly fewer in laparoscopy       |
| Hospital Stay (days)         | 2.5 ± 1.0                  | 5.0 ± 1.5           | Shorter in laparoscopic group            |
| Return to Activity (days)    | 7 ± 2                      | 14 ± 3              | Faster recovery in laparoscopy group     |
| Readmission Rate             | 3 (2.3%)                   | 8 (11.4%)           | Higher readmission with open surgery     |
| Reoperation Rate             | 1 (0.8%)                   | 4 (5.7%)            | Lower reoperation in laparoscopic group  |

### Key Insights:

- **Laparoscopic surgery** offers:
  - Shorter operative time
  - Less intraoperative and postoperative complications
  - Quicker recovery and return to normal activity
  - Fewer readmissions and reoperations
- **Open surgery** is associated with:
  - Older patients
  - Higher pain and complication rates
  - Longer hospital stay and recovery

### Discussion:

In line with previous studies from the global literature, we conducted a retrospective analysis of 200 patients who underwent either an open or laparoscopic appendectomy. Our data showed that laparoscopic appendectomy was associated with a shorter hospital stay, less postoperative pain, fewer complications, and a faster return to normal activities than open surgery. Laparoscopic surgery had a lower incidence of surgical site infections and a shorter operating time. However, our study found that laparoscopic procedures resulted in shorter hospital stays. This disparity could be the consequence of differences in hospital procedures, postoperative care, or patient selection. Supporting literature, including studies by Antonio Biondi and associates, the Holy Family Hospital Surgery Department, and Tomoya Takami et al., further bolsters our conclusions. These studies demonstrate the benefits of laparoscopic surgery, including reduced rates of surgical site infections and better overall patient recovery. These trends are supported by the statistical analysis of our dataset, especially for the younger age groups that have the lowest rates of complications after laparoscopic surgery.

A retrospective analysis of patients revealed that 200 patients benefited from laparoscopic appendectomy. These advantages included a reduced need for analgesics, a quicker return to normal life, and a lower rate of surgical site infections (1.4% vs. 10.6%). By showing that laparoscopic appendectomy is a safer, more effective procedure with fewer side effects and a better recovery period after surgery, our findings lend credence to these conclusions.

In conclusion, our study and previous research consistently demonstrate that the best treatment for appendicitis is laparoscopic appendectomy, particularly when surgical resources and expertise are available.

### **Conclusion :**

Our study shows that laparoscopic surgery is linked to better clinical outcomes than open surgery, based on a retrospective analysis of 200 patients who had either an open or laparoscopic appendectomy. Patients undergoing laparoscopic appendectomy had significantly better outcomes in terms of key indicators like decreased postoperative pain, fewer complications, shorter hospital stays, and quicker return to normal activities. The slightly longer operating time required for laparoscopic procedures was outweighed by the benefits of postoperative recovery and a lower need for readmission or reoperation.

Finally Conclusion is, laparoscopic appendectomy is a more effective and safe surgical treatment for appendicitis. It is the recommended option in clinical practice where resources and experience are available because of its minimally invasive nature, which improves patient satisfaction and reduces postoperative complications.

### **Acknowledgement**

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### **Recommendation:**

From the study, we concluded that the laparoscopic appendectomy is more advanced and beneficial than open appendectomy in larger aspects. So, in order to improve the patients' outcomes and health care system, all the hospitals should have a better set-up of laparoscopic procedures. There should be the provision of hands-on training for the surgeons on laparoscopic procedures. In order to achieve this goal, the local hospital administrations and the government responsible for health care system should work collaborately.

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