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A COMPARATIVE PROSPECTIVE STUDY LAPAROSCOPIC VERSUS OPEN APPENDICECTOMY IN ADULTS.

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ABSTRACT

Background
A common surgical emergency that typically necessitates an appendicectomy is appendicitis. The decision between laparoscopic and open appendicectomy has generated a lot of discussion, as each procedure has unique benefits and drawbacks. Although laparoscopic surgery is frequently chosen due to its minimally invasive nature, questions still surround its wider applicability, especially in situations of complex appendicitis. Based on several intraoperative and postoperative factors, this study sought to compare laparoscopic versus open appendicectomies.

Materials and Methods
Two groups of fifty patients undergoing interval appendicectomies were randomly assigned. Twenty-five patients in group A had laparoscopic appendicectomies, while twenty-five patients in group B had open appendicectomies.

Results
It was simpler to evaluate the intraoperative findings and confirm the diagnosis in group A patients. Furthermore, patients in group A experienced less discomfort, fewer post-operative problems, and a shorter hospital stay.

Conclusion
Laparoscopic appendicectomy is the preferred method for appendicectomy due to its superior results.

Recommendation
The authors recommend LA as a routine surgical approach for acute appendicitis.

Keywords: *Appendicitis, Open appendicectomy, Laparoscopic appendicectomy, Complications*
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INTRODUCTION

A muscular tube that is blind and attached to the caecum is called the vermiform appendix. It is the big caecum's morphologically undeveloped distal end. It tends to cause inflammation, which leads to acute appendicitis, a clinical condition [1]. This vermiform appendix becomes inflamed when someone has appendicitis. In all age categories, acute appendicitis is the most frequent cause of abdominal surgery and the most frequent abdominal emergency globally. Men's lifetime risk of appendicitis is 8.6%, while women's is 6.7%[2,3]. A perforated appendix is seen in 13% to 20% of individuals who present with acute appendicitis. Appendix perforation is more common in men (18%) than in women (13%). The temporal course varies from case to case, although the risk of perforation is significant 24 hours following the onset of appendicitis symptoms. Within 24 hours after the onset of symptoms, there is a 20% chance of an appendix perforation [4]. Appendicitis is typically treated with an appendicectomy, which can be performed in two ways i.e. laparoscopic appendicectomy or open appendicectomy. Surgeons have been discussing these two methods for a while, and numerous studies have contrasted their outcomes in terms of efficacy, safety, and recovery time. Laparoscopic appendicectomy has been more and more common over the past 20 years because of its less invasive nature and fewer adverse effects, including shorter hospital stays and a faster return to normal activities [5]. With the least amount of tissue damage feasible, a laparoscopic appendicectomy removes the inflamed appendix through a succession of tiny abdominal incisions using specialized tools and a camera. Better cosmetic results and a decreased risk of wound infections have been shown with this method as opposed to conventional open surgery, which requires a larger incision [6]. Concerns remain regarding the potential for longer operating sessions, higher costs, and the learning curve associated with

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mastering laparoscopic procedures despite these advantages [7]. Open appendicectomy, on the other hand, has been the gold standard for almost a century. The process involves accessing and removing the appendix through a single, larger incision. It is associated with higher rates of postoperative discomfort, comparatively long hospital stays, and a delayed return to normal activities, even though it is a straightforward procedure with a good track record [8]. However, there are still circumstances in which an open appendicectomy is preferable, such as when laparoscopic surgery is not advised, a patient has a severe case of appendicitis, or there are several adhesions [9]. Current studies are still evaluating how well these two surgical techniques perform in comparison, particularly for certain patient groups such as the elderly, obese, and those with complicated appendicitis [10]. There is growing evidence that laparoscopic appendicectomy is the better option in many cases because of its better recovery profile and decreased risk of complications [11]. However, the decision between laparoscopic and open surgery should be decided individually, considering the patient's requirements, the experience of the surgeon, and the available resources [12].

The present study was designed to compare the outcome of laparoscopic appendicectomy versus open appendicectomy in adults.

MATERIALS AND METHODS

Study Design

This study is a prospective comparative analysis.

Study Setting

The study was conducted over 12 months from November 2023 to October 2024 at Lord Buddha Koshi Medical College and Hospital, Bihar. The hospital has the facilities required for both open and laparoscopic surgery.

Participants

The study comprised 50 adult patients who were scheduled for appendicectomy after receiving a diagnosis of acute appendicitis.

Inclusion Criteria

- Adults between the ages of 18 and 65.
- Patients in whom Acute appendicitis was diagnosed clinically and/or radiologically.
- Individuals who were deemed suitable for general anesthesia surgery.

Exclusion Criteria

- Patients with a prior history of abdominal surgery are excluded.
- Expectant mothers.
- Individuals whose body mass index (BMI) is greater than 35.
- Individuals with coexisting illnesses that make laparoscopic surgery inappropriate.

Data Collection

A systematic data collection form was used to gather data prospectively. Patient demographics, surgical specifics, postoperative results, and follow-up data were all included in the data. Patients were divided into two groups at random according to the last indoor registration number's odd (group A) or even (group B) digits. Twenty-five patients in group A had laparoscopic appendicectomies, while twenty-five patients in group B had open appendicectomies.

Ethical considerations

All patients provided written informed permission, specifically mentioning the possibility of switching to an open operation. Ceftriaxone (1 gram intravenously) was injected before, during, and after surgery as part of the perioperative antibiotic protocol.

Procedure

Laparoscopic appendicectomy

In every instance, a Foley catheter was inserted before port installation to guarantee bladder decompression. The telescope and camera were connected to a sub-umbilical 10mm connection. Dissecting tools were inserted into a 5 mm midline port in the right lower abdomen and a second 5 mm hole in the left lower abdomen. After identification and dissection, the appendix was found to be adhesion-free. Using bipolar coagulation, the mesoappendix was cauterized till the base was reached. Chromium catgut end loops already developed were used to ligate the appendix's base. The appendix was placed in a plastic bag and then removed through the sub-umbilical line. To find concomitant pathology, all visible pelvic and abdominal viscera were viewed, particularly in females whose uterus and adnexa were examined. Analgesia was given to each patient. Only when a patient had vomiting were antiemetics administered. Oral feedings were permitted for patients as soon as bowel motions resumed. After passing regular stools, they were released from the hospital.

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Open appendicectomy

Mac Burney's or Lanz's incision was used in all open instances. After the peritoneal cavity was opened, the pathology was verified. The mesoappendix was clamped, ligated, and divided when the appendix was found. The right side's fallopian tubes and ovaries were inspected. Layers of closure were applied to the incision.

Statistical methods

For data analysis, SPSS statistical software version 19 was utilized. Prospective data was gathered from patients who had both open and laparoscopic appendicectomies. To compare categorical (qualitative) variables, the Chi-square test was employed. A significant p-value was less than 0.05. Data that was continuous (quantitative) was compared using the student t-test.

RESULTS

25 patients in group A underwent laparoscopic appendicectomy, while 25 patients in group B underwent open appendicectomy.

1. **Age**

   Patients in group A and group B in this study had mean ages of 22.6±4.7 and 23.5±9.7 years, respectively.

2. **Sex**

   Whereas 16 patients in group A and 8 patients in group B were females, nine patients in group A and seventeen in group B were males.

3. **Operating time**

   Group B's operating time was 26.40±4.68 minutes, whereas Group A's was 45.40±7.89 minutes.

4. **Intraoperative results**

   Nineteen patients in group B had a retrocecal appendix, while twenty individuals in group A did. Nine cases in each group had no adhesions, while sixteen cases in each group A and oedematous B had peri-appendiceal adhesions. In all 25 patients from groups A and B, the appendix was enlarged and had dilated veins on the surface, which suggested inflammation. None of the subjects in the study had any further pathology found. No statistical significance was attained by the observation (Table 2).

5. **Pain score and indications**

   The visual analog scale (VAS) was used to assess post-operative pain. Throughout the three days after surgery, group A patients' VAS scores were lower than those of group B patients. It was determined that this observation was statistically significant (Table 3).

6. **Complications following surgery**

   Two members of group A and three members of group B experienced paralytic ileus. Two group A cases developed port site infections. One patient in group B developed an infection at the surgical site. Nevertheless, Table 4 shows that the incidence of complications did not reach statistical significance.

7. **Days of hospital stay**

   Group A patients stayed in the hospital for 3.08±0.86 days, while group B patients stayed there for 6.64±1.07 days. According to Table 5, this observation was statistically significant.

Table 1: Operation time (in minutes)

Group	No. of participants(N)	Mean(minutes)	Standard deviation
A	25	45.4	7.895
B	25	26.4	4.682

(P value <0.001, Significant) Unpaired t-test

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Table 2: Intraoperative results

Appendix location	**Group A**	**Group B**
Non-retrocaecal	5	6
Retrocaecal	20	19
Adhesions		
Absent	9	9
Present	16	16
Appendix status		
Non-inflamed	0	0
Inflamed	25	25

(P value>0.05, Not significant) (Chi-square test)

Table 3: VAS (postoperative pain scores) on days 1, 2, and 3 following surgery

	Group A	**Group B**
VAS 1	4.3 plus±0.9(3-6)	5.6±0.6(5-7)
VAS 2	2.7±0.7(2-5)	3.8±0.8(3-5)
VAS 3	1.5±0.6(1-3)	2.4±0.7(1-4)

(P value<0.05, Significant) Unpaired t-test

Table 4: Complications following surgery

	Group A	**Group B**	**Total**
Infection of wound	-	1(4%)	1(2%)
Infection of the port site	2(8%)	-	2(4%)
Paralytic Ileus	2(8%)	3(12%)	5(10%)
Total	25	25	50

X2=1.087 DF=1 P value=0.297(Not significant) (Chi square test)

Table 5: Days of hospital stay

Group	**N**	**Mean(days)**	**Standard Deviation**
A	25	3.08	0.862
B	25	6.64	1.075

(P value<0.001, Significant) Unpaired t-test

DISCUSSION

Regarding morbidity statistics in particular, the advent of laparoscopy in surgery has resulted in a remarkable transformation in surgical results [13]. Laparoscopy has become a very popular choice due to the avoidance of uncomfortable lengthy incisions, reduced need for analgesics, less scarring, and a shorter hospital stay[14].The current study examined two common techniques for performing appendicectomy: laparoscopic and open appendicectomy. Patients in groups A and B received laparoscopic and open appendicectomies, respectively. Patients in groups A and B had respective mean ages of 22.6±4.7 and 23.5±9.7 years. Young patients without any concomitant conditions made up both groups. Therefore, age could not be regarded as a contributing factor when evaluating the surgical outcome. Numerous studies demonstrated that the laparoscopic technique could be applied safely to people of all ages, from young children to the elderly [15]. In the current study, women made up 32% of group B patients and 64% of group A patients. Due to the ability to diagnose adnexal diseases that closely resemble appendicitis in females, laparoscopy has a clear benefit in the female population. An unnecessary appendectomy can be avoided by using laparoscopy, which has an erroneous edge diagnosis of adnexal diseases [15]. As a result, the laparoscopic method lowers the possibility of misdiagnosing appendicitis in general. The cosmetic result is an additional benefit for the female population. Laparoscopic surgery is a better option because the scars are less noticeable [15]. All of the body's physiological organ systems are put to the test when a female patient is pregnant. It is extremely difficult to perform surgery during this time since it puts the mother and fetus in danger [16]. However, none of the ladies in either group were pregnant for this study. Nonetheless, several studies have shown that a laparoscopic appendicectomy can be carried out successfully during pregnancy without endangering the woman or the fetus [16,17]. In both groups, a proper local visceral examination was conducted as is customary. In open group B, the ileocecal junction, ileum, and ipsilateral adnexa of female patients were inspected after the appendix was checked to confirm the pathology. Nonetheless, laparoscopy offers a significant benefit since it allows for visualization of the entire

abdomen, including the pelvis [18].It is even possible to visualize the contralateral adnexa in female patients. Laparoscopy is therefore very beneficial for verifying the diagnosis before the appendix is removed. A prevalent finding in the current investigation was adhesions and the appendix's retrocaecal location. Compared to the open approach, laparoscopy helps dissect a retrocecal appendix significantly more quickly and safely [19]. Before starting the dissection, the patient should be positioned correctly (head low with left lateral) to improve visualization of the appendix by moving the bowel loops that obscure it. According to the current study, group A patients' mean operating time was 45.40±7.89 minutes, while group B patients were 26.40±4.68 minutes. The group A patients' longer operating times were caused by the trocars being inserted correctly and then being carefully and meticulously dissected using a laparoscopic approach in a small area. Laparoscopy restricts manual dexterity during dissection since the instruments can only be used at specific angles and in specific orientations [20xx]. Because the organ in question can be examined from all angles, the open technique improves hand dexterity. Any issues that arise with an open appendicectomy may be resolved right away, but with a laparoscopic treatment, there may occasionally be a technical difficulty that lengthens the procedure's duration. The operating time was determined to be statistically significant in the current investigation. This was in line with earlier studies [21]. The Visual Analogue Scale (VAS) was used in this study to measure the severity of pain. On days one, two, and three, the level of pain was measured. For all three days, group A's discomfort was less severe than group B's. This unequivocally demonstrates that, in comparison to open operations, minimally invasive techniques cause less morbid discomfort. This observation offers the laparoscopic technique a major benefit [22, 23]. Therefore, compared to an open technique, the laparoscopic procedure requires less postoperative analgesia. Pain is considerably lessened with smaller puncture incisions and less dissection using accurate tools. Paralytic ileus and surgical site infections were the complications assessed in this study. Group A was shown to have a lower incidence of paralytic ileus than group B. This resulted in the bowel's tissue being handled very little during the procedure. Other research showed similar findings. One concerning consequence is still port site infection. The location of the umbilical port is where it is most frequently observed [24].Two individuals in group A of the current trial experienced an infection at the umbilical port site. After six months of postoperative follow-up, none of these patients experienced an incisional hernia. The nature of the organisms producing port site infections presents the biggest management concerns [25,26]. Managing resistant pathogens like MRSA and atypical mycobacteria is challenging. As a result, the highest level of aseptic care cannot be used, particularly when withdrawing the specimen and sealing the port site incision [26]. After the sheath is closed, the incision can be effectively irrigated with a diluted hydrogen peroxide solution. To support this technique as a standard of treatment, more thorough research must be done. The length of hospitalization is thought to be correlated with the standard of surgical care [27] In this regard, laparoscopic operations have outperformed open treatments. In this study, group A patients stayed in the hospital for an average of 3.08 days, while group B patients stayed for an average of 6.64 days. This statistically significant finding supported the clear benefit of laparoscopy over an open operation, which benefits the patient and the healthcare system in two ways [28].

CONCLUSION

Laparoscopic appendicectomies are better than open ones, to sum up. Laparoscopic appendicectomies are becoming more and more popular due to their meticulous and excellent dissection, minimal bowel handling, decreased pain that requires less postoperative analgesia, decreased risk of surgical site infections, aesthetically pleasing incisions, and shorter hospital stays.

LIMITATIONS

The limited sample size and the fact that the study only included elective treatments are its limitations.

RECOMMENDATION

The authors recommend LA as a routine surgical approach for acute appendicitis.

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To all the participants for their cooperation and patience.

DATA AVAILABILITY

Data is available upon request.

AUTHOR CONTRIBUTIONS

RR collected and analyzed the data, and wrote and edited the manuscript.

LIST OF ABBREVIATIONS

LA- Laparoscopic appendicectomy
BMI- body mass index
VAS- visual analog scale

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No source of funding.

CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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