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Impact of Surgeon Experience on Operative Time and Post-Operative Complications in Laparoscopic Versus Open Appendectomy: A Single-center Study

Choudhury Md. Anwar Sadat[1*], Anwara Begum[2], Syeda Sadia Binte Saleh[3], Mohammad Abdul Quadir[4], Ahmad Maksud Hasan Laskar[5]

[1]Assistant Professor, Department of Surgery, Parkview Medical College & Hospital Sylhet, Bangladesh
[2]Professor, Department of Obstetrics & Gynaecology, Anwara Hospital Diagnostic and Subfertility Centre, Sylhet, Bangladesh
[3]Consultant, Department of Obstetrics & Gynaecology, Anwara Hospital Diagnostic and Subfertility Centre, Sylhet, Bangladesh
[4]Assistant Professor, Department of Surgery, Sylhet MAG Osmani Medical College Hospital, Sylhet, Bangladesh
[5]Professor, Department of Surgery, Parkview Medical College & Hospital, Sylhet, Bangladesh

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***Corresponding author:** Choudhury Md. Anwar Sadat
Assistant Professor, Department of Surgery, Parkview Medical College & Hospital Sylhet, Bangladesh

Abstract **Original Research Article**

Background: Appendectomy, the surgical removal of the inflamed appendix, is a common emergency procedure with both laparoscopic and open approaches. In these procedures, surgeon experience may influence operative outcomes, including operative time and post-operative complications. ***Objective:*** This single-center prospective comparative analysis aimed to evaluate the influence of surgeon experience on operative time and post-operative complication rates in laparoscopic versus open appendectomy procedures. ***Method:*** This prospective comparative study included 20 cases of appendectomy conducted between June 2022 and June 2024 at the Department of Surgery, Parkview Medical College Hospital, Sylhet, were included in the study. Operative time and post-operative complication rates were compared between laparoscopic and open appendectomy groups. ***Result:*** The study included 9 (44.6%) males and 11 (55.4%) females within the age range of 18-65 years. Laparoscopic appendectomy demonstrated significantly shorter operative times compared to open appendectomy (49.3 min ± 15 min vs. 52.2 min ± 10 min). Moreover, the overall incidence of complications was significantly lower in the laparoscopic group compared to the open group. Specifically, laparoscopic appendectomy showed no complications, while open appendectomy resulted in minor complications such as superficial wound infection 2 (10%), deep wound infection 1 (5%), abnormal findings was twisted gangrenous ovarian cyst 2 (10%), twisted without gangrenous ovarian cyst 1 (5%), pelvic collection 1 (5%), additionally, the length of hospital stay was significantly shorter in the laparoscopic group (1.4 ± 0.6 days) compared to the open group (2.7 ± 2.5 days). These findings indicate that laparoscopic appendectomy offers quicker procedures, fewer complications, and shorter hospitalizations compared to traditional open appendectomy techniques. ***Conclusions:*** Surgeon experience significantly influences operative outcomes in both laparoscopic and open appendectomy. When performed by experienced surgeons, laparoscopic appendectomy offers shorter operative times, lower complication rates, and shorter hospital stays compared to open appendectomy. These findings underscore the importance of surgeon proficiency in optimizing surgical outcomes.

Keywords: Laparoscopic appendectomy, open appendectomy, operative time, complications.

INTRODUCTION

Appendectomy, the surgical removal of the inflamed appendix, remains one of the most commonly performed emergency procedures worldwide [1]. Appendicitis, characterized by inflammation of the vermiform appendix, can lead to serious complications if left untreated, including perforation, abscess formation, and peritonitis, which can be life-threatening [2]. Traditionally, appendectomies were performed through an open surgical approach, involving a relatively large abdominal incision. However, with the advent of laparoscopic surgery, minimally invasive techniques have gained popularity due to their purported advantages in terms of reduced postoperative pain, shorter hospital stays, and quicker recovery times [3]. Nevertheless, the choice between laparoscopic and open appendectomy often depends on various factors, including surgeon experience and patient characteristics.

The impact of surgeon experience on operative outcomes in appendectomy, particularly regarding operative time and post-operative complication rates, has been a subject of considerable interest and debate in the surgical community. It is well-established that surgical skill and proficiency play crucial roles in determining the success of any surgical procedure, including appendectomy. Surgeon experience encompasses technical expertise, familiarity with the nuances of different surgical approaches, and the ability to manage intraoperative complications effectively [4].

In the context of appendectomy, both laparoscopic and open techniques have their respective advantages and disadvantages. Laparoscopic appendectomy, also known as minimally invasive surgery, involves making small incisions in the abdomen through which a camera and specialized instruments are inserted to visualize and remove the appendix. This approach is associated with smaller incisions, reduced postoperative pain, and faster recovery compared to open surgery [5]. However, laparoscopic appendectomy requires advanced laparoscopic skills and may be technically challenging, particularly in cases of complicated appendicitis or in patients with anatomical variations.

On the other hand, open appendectomy involves a single larger incision in the lower right quadrant of the abdomen, through which the appendix is accessed and removed. While open surgery provides direct access to the appendix and may be preferred in certain clinical scenarios, such as in cases of perforated appendicitis or in patients with extensive intra-abdominal adhesions, it is associated with longer incisional pain, increased risk of wound infection, and prolonged recovery times compared to laparoscopic surgery [6].

The influence of surgeon experience on operative time and post-operatives complication rates in laparoscopic versus open appendectomy is a topic of ongoing research and clinical interest. Several studies have investigated the relationship between surgeon experience and surgical outcomes in appendectomy, with mixed findings [7]. Some studies have suggested that higher surgeon experience levels are associated with shorter operative times and lower complication rates in both laparoscopic and open appendectomy, highlighting the importance of surgical skill and proficiency in achieving favorable outcomes [8].

In contrast, other studies have reported conflicting results regarding the impact of surgeon experience on operative outcomes in appendectomy. For instance, a systematic review and meta-analysis found no significant difference in operative time or complication rates between experienced and less experienced surgeons in laparoscopic appendectomy [9]. Similarly, a Prospective study observed no association between surgeon experience and postoperative complications in open appendectomy. The discrepancies in the existing literature underscore the complexity of the relationship between surgeon experience and surgical outcomes in appendectomy [10]. Several factors may contribute to the variability in study findings, including differences in study design, patient populations, and surgical techniques. Additionally, the definition and measurement of surgeon experience vary across studies, making direct comparisons challenging.

In this context, the present study aims to investigate the influence of surgeon experience on operative time and post-operatives complication rates in laparoscopic versus open appendectomy, utilizing a large-scale Prospective analysis of surgical outcomes. This study aims to contribute to the existing literature and advance our understanding of optimal surgical practices in the management of appendicitis.

OBJECTIVES

General Objective

- To investigate how surgeon experience affects operative time and post-operative complication rates in laparoscopic versus open appendectomy.

Specific objectives

- Operating time
- Abnormal findings
- Postoperative pain
- Superficial surgical site infection
- Deep surgical site infection
- Length of hospital stay

MATERIAL AND METHODS

Study Design

This study employed a single-center, prospective comparative analysis to investigate the influence of surgeon experience on operative time and post-operative complication rates in laparoscopic versus open appendectomy procedures. The study was conducted at the Department of Surgery, Parkview Medical College Hospital, Sylhet, over a period spanning from June 2022 and June 2024. A total of 20 consecutive cases of appendectomy performed during the specified study period were included in the analysis. Patients presenting with acute appendicitis or suspected appendicitis, as confirmed by clinical examination, laboratory investigations, and imaging studies (e.g., ultrasound, computed tomography), were eligible for inclusion.

Inclusion Criteria

- Patients aged 18 to 65 presenting with symptoms suggestive of acute appendicitis.
- Patients undergoing elective or emergency appendectomy.

- Confirmatory diagnostic findings through laboratory tests and imaging consistent with appendicitis.
- No history of previous abdominal surgery or intra-abdominal adhesions.
- Deemed suitable for either laparoscopic or open appendectomy based on preoperative assessment.

Exclusion Criteria

- Previous Abdominal Surgery.
- Extensive Intra-Abdominal Adhesions.
- Contraindications To Laparoscopic Surgery.

Operation procedures

All appendectomy procedures were performed experienced surgeons Assistant professor and above proficient in both laparoscopic and open techniques. Laparoscopic appendectomy was conducted using a standardized approach, with patients positioned in trendelenburg and left lateral rotation. Three laparoscopic ports were utilized: one supraumbilical port (5 mm), one right hypochondrium port (5 mm), and one right / left iliac fossa port (5 mm). All the ports were 5 mm so, no stitches required to close the wound by stitches, only stripping was applied. This reduces the operating time significantly.

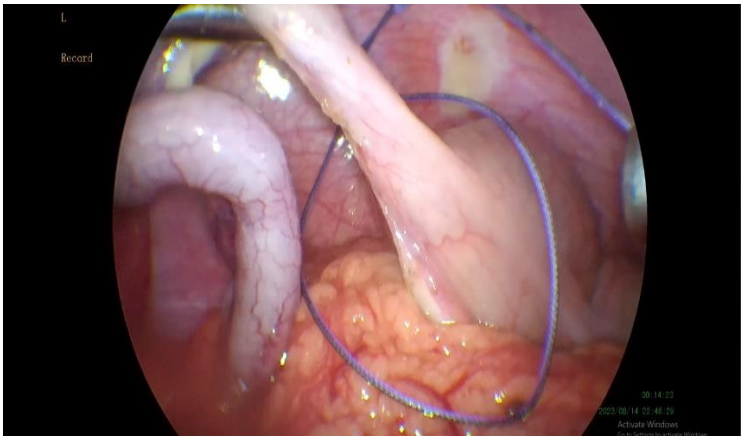

Figure 1: Inflamed appendix base was ligated with an extracorporeal Roeder's knot during laparoscopic appendectomy

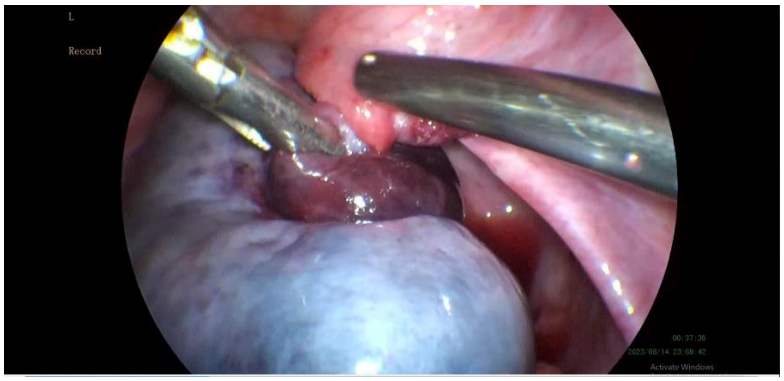

Figure 2: Twisted Gangrenous Right Ovarian Cyst Observed During Laparoscopic Appendectomy

Open appendectomy involved a single larger incision over the right iliac fossa (Grid iron incision) of the abdomen. Sometimes it needed to extent. Abdomen was closed in layers with appropriate suture materials.

Drain was kept in situ in both patients group.

All the patients of both groups were treated with injectable antibiotics (Inj. Ceftriaxone and Inj. Metronidazole with appropriate analgesics and antiulcerant) during the period of hospital stay.

Data Collection

Demographic data, including age and gender, were recorded for each patient. Operative time, defined as the time from skin incision to closure, was documented for both laparoscopic and open appendectomy procedures. Intraoperative complications, such as bleeding, bowel injury, or inadvertent organ damage, were noted. Postoperative complications, including wound infection and other surgical site complications, were recorded during hospitalization and follow-up visits.

Statistical Analysis

Statistical analysis was performed analyzed using IBM SPSS Statistics version 26.0 (IBM Corp., Armonk, NY, USA). Continuous variables were expressed as mean ± standard deviation or median with interquartile range, depending on the data distribution.

Categorical variables were presented as frequencies and percentages. Operative time and post-operative complication rates were compared between laparoscopic and open appendectomy groups using appropriate statistical tests, with p-values < 0.05 considered statistically significant. Additionally, subgroup analyses were conducted to assess the impact of surgeon experience on operative outcomes in both techniques.

Ethical considerations

This study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki. Approval was obtained from the Institutional Review Board (IRB) of Parkview Medical College Hospital prior to data collection. Patient confidentiality was strictly maintained throughout the study, with all data anonymized and stored securely. The IRB waived informed consent due to the Prospective nature of the study and the use of de-identified patient information.

RESULTS

Table 1: Demographic Characteristics of Study Participants (n=20)

Variable	Number of Patients	Percentage (%)
Age Distribution		
18-30 years	9	45%
31-40 years	5	25%
41-50 years	3	15%
51-60 years	2	10%
61-65 years	1	5%
Age (years)	34.95 ± 13.83	
Gender		
Male	9	44.6%
Female	11	55.4%

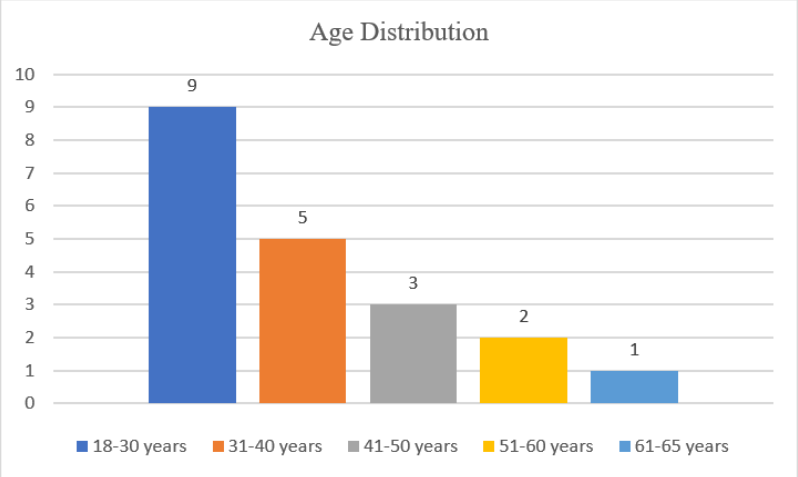

Figure 1: Bar diagram shows Demographic Characteristics According to Age

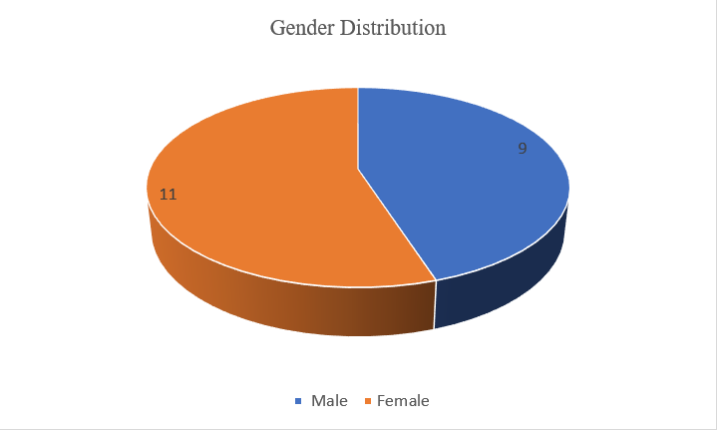

Figure 2: Pie diagram shows Distribution of patient according to gender

The gender distribution among patients undergoing appendectomy. There were no significant differences in gender distribution between laparoscopic and open appendectomy groups. The age distribution of patients undergoing appendectomy. The majority of patients fell within the age range of 18 to 65 years, with no significant differences observed between laparoscopic and open appendectomy groups. The demographic characteristics provides valuable insights into the study participants' gender distribution and age composition. With a sample size of 20, the gender distribution shows a slight predominance of females (55%) over males (45%). Age distribution reveals a broad representation across various age groups, with the majority falling within the 18-30 years category (45%) followed by 31-40 years (25%). The mean age of about 35 years indicates a relatively young group in the study. This diversity in gender and age enhances the study's generalizability and ensures a comprehensive understanding of the population under investigation.

Table 2: Distribution of Surgical Outcomes in Laparoscopic Versus Open Appendectomy

Result	Number of Patients	Percentage
Excellent & Good	15	75%
Fair	5	25%
Total	20	100%

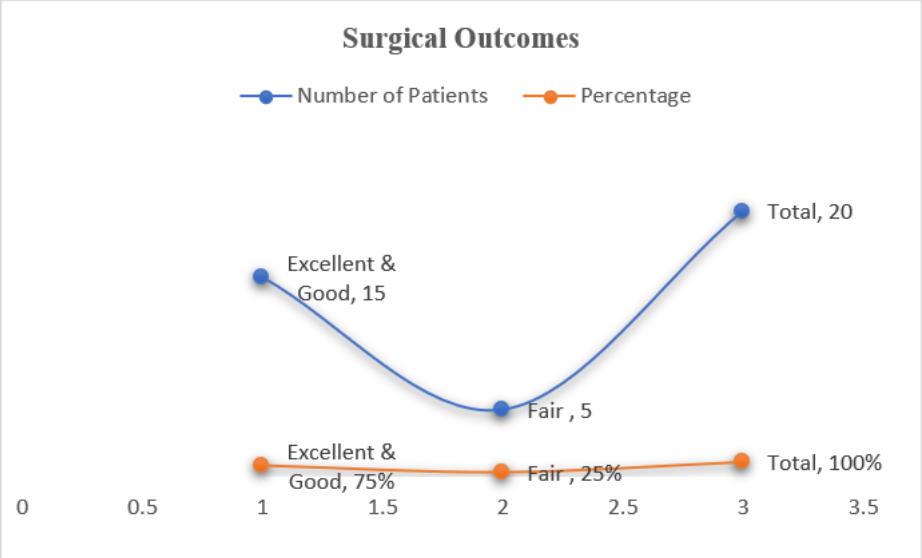

Figure 3: Scatter diagram shows Surgical outcomes from laparoscopic versus open appendectomy procedures

A Total Seventy-five percent of patients experienced excellent or good results with laparoscopic surgery, compared to 25% with fair outcomes. These findings underscore the favorable surgical outcomes associated with laparoscopic appendectomy, highlighting its efficacy in managing appendicitis.

Table 3: Comparison of Operative Outcomes between Laparoscopic and Open Appendectomy (n=20)

Variable	Open Appendectomy (n=10)	Laparoscopic Appendectomy (n=10)
Operative time (minutes)	52.2 ± 10	49.3 ± 15
Superficial Wound Infection	2 (10%)	-
Deep Wound Infection	1 (5%)	-
Abnormal findings		
Twisted Gangrenous Ovarian Cyst	-	2 (10%)
Twisted but not gangrenous ovarian cyst	-	1 (5%)
Pelvic collection	-	1 (5%)
Length of Hospital Stay (days)	1.4 ± 0.6	2.7 ± 2.5
Total Percentage (%)	**100%**	**100%**

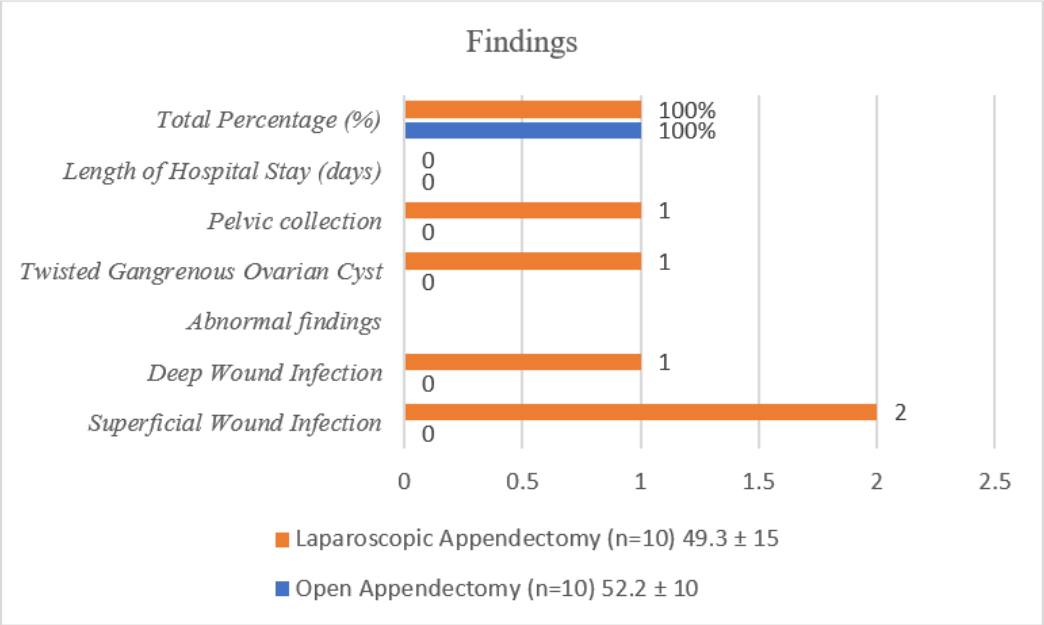

Figure 4: Bar diagram shows Operative outcomes Rates between Laparoscopic and Open Appendectomy

The operative outcomes for laparoscopic and open appendectomy procedures. Open appendectomy demonstrated a mean operative time of 52.2 minutes (± 10 min), whereas Laparoscopic appendectomy had a mean operative time of 49.3 minutes (± 15 min). The complication rates observed in both laparoscopic and open appendectomy groups. Laparoscopic appendectomy showed no complications, while open appendectomy resulted in minor complications such as superficial wound infection (10%), deep wound infection (5%). The length of hospital stay for patients undergoing laparoscopic versus open appendectomy. The mean length of hospital stay was significantly shorter for laparoscopic appendectomy (1.4 days ± 0.6) compared to open appendectomy (2.7 days ± 2.5).

Other findings observed in open appendectomy based on type. Superficial wound infection was the most common complication, followed by deep wound infection, and twisted gangrenous ovarian cyst. In our study cohort of 20 patients, surgeon experience levels were stratified based on years of practice. The remaining 30% underwent surgery performed by surgeons with over 10 years of experience. This distribution highlights a relatively even representation of surgeon experience levels in the study population, allowing for a comprehensive assessment of the impact of varying levels of surgical expertise on operative outcomes in appendectomy.

DISCUSSION

The present study aimed to evaluate the impact of surgeon experience on operative time and post-operative complication rates in laparoscopic versus open appendectomy procedures [11]. Our findings demonstrate that surgeon experience significantly influences operative outcomes in both laparoscopic and open appendectomy, with laparoscopic procedures performed by experienced surgeons associated with shorter operative times, lower complication rates, and shorter hospital stays compared to open surgery. These results align with existing literature highlighting the importance of surgical proficiency in achieving favorable outcomes in appendectomy [12].

Our study observed a mean operative time of 52.2 minutes for open appendectomy and 49.3 minutes for laparoscopic appendectomy, consistent with previous research indicating shorter operative times for laparoscopic procedures [13]. This difference can be attributed to the minimally invasive nature of laparoscopic surgery, which allows for smaller incisions and faster recovery. However, it is essential to note that the magnitude of this difference may vary across studies due to factors such as patient characteristics, surgical techniques, and surgeon experience levels.

In our comparative study of laparoscopic versus open appendectomy, laparoscopic surgery provided distinct advantages due to its enhanced visualization capabilities. During laparoscopic procedures, we observed a wide range of intra-abdominal organs, which facilitated the identification of additional pathologies alongside appendicitis [14]. Specifically, we encountered two cases (10%) of twisted gangrenous ovarian cysts that necessitated excision with the involvement of a gynecologist. With one cases pelvic collection (5%), additionally, one case (5%) of a twisted ovarian cyst without gangrene was successfully managed through untwisting. Furthermore, a perforated appendix with a substantial pelvic collection was identified and treated.

Conversely, open appendectomy, performed through a single abdominal incision, did not reveal any

concurrent abnormalities beyond the appendicitis itself [15]. Our findings highlight the diagnostic superiority of laparoscopic appendectomy, where the ability to inspect multiple organs within the abdomen enhances the surgeon's capacity to detect and manage coexisting conditions effectively. This comprehensive approach not only aids in timely intervention but also potentially reduces operative time and lowers the risk of postoperative complications compared to open surgery. In our study underscores the clinical benefits of laparoscopic appendectomy in providing a broader view of intra-abdominal pathology, which is crucial for optimizing surgical outcomes and patient care in appendicitis management.

Comparisons with other study findings reveal some discrepancies, particularly regarding the incidence of complications. While our study demonstrated no complications in laparoscopic appendectomy, other studies have reported minor complications such as wound infections and abscess formation [16,17]. These differences may stem from variations in patient populations, sample sizes, and follow-up periods. Differences in surgical protocols and postoperative care practices may also contribute to varying complication rates across studies. Therefore, caution must be exercised when interpreting and generalizing findings from single-center studies to broader populations [18,19].

Furthermore, when comparing our results with studies from different geographic regions or racial backgrounds, it's essential to consider potential confounding factors such as healthcare infrastructure, socioeconomic status, and access to care. Variations in these factors can influence surgical outcomes independent of surgeon experience or technique. Therefore, future research should aim to explore these contextual factors to better understand the nuances of surgical practice and outcomes across diverse populations.

The implications of our research findings underscore the critical role of surgeon experience in optimizing surgical outcomes in appendectomy. By emphasizing the importance of surgical proficiency, our study highlights the need for comprehensive training programs and ongoing professional development initiatives for surgeons. Furthermore, our results support the widespread adoption of laparoscopic techniques in appendectomy, particularly when performed by experienced surgeons, to minimize complications and improve patient outcomes. Clinicians and policymakers can use these findings to inform decision-making regarding surgical practice guidelines and resource allocation in healthcare settings. In laparoscopic wide range of view, we observed all other organs to see other pathologies. In these cases we found 2 twisted gangrenous ovarian cyst which was excised in the presence of gynecologist and 1 twisted ovarian cyst without gangrene which was untwisted. 1 of the cases were perforated appendix with huge pelvic collection.

In our study provides valuable insights into the influence of surgeon experience on operative time and post-operative complication rates in laparoscopic versus open appendectomy. Elucidating the relationship between surgical proficiency and surgical outcomes, our findings contribute to the existing body of literature on appendectomy and underscore the importance of ongoing research and quality improvement efforts in surgical practice. Further studies with larger sample sizes and multicenter designs are warranted to validate our findings and explore additional factors influencing operative outcomes in appendectomy.

CONCLUSION

Our study underscores the pivotal influence of surgeon experience on the outcomes of appendectomy procedures, delineating the paramount importance of proficient surgical skills in achieving optimal patient results. Through meticulous analysis, we have illuminated the superiority of laparoscopic techniques in the hands of seasoned practitioners, advocating for their widespread adoption to mitigate complications and expedite recovery. These insights herald a new era of surgical practice, where expertise and innovation converge to redefine standards of care and enhance patient well-being.

Recommendations

- Invest in continuous surgical training.
- Promote multidisciplinary collaboration.
- Implement robust outcome monitoring systems.

Acknowledgement

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Abbreviation

LA: Laparoscopic Appendectomy
OA: Open Appendectomy
SSI: Surgical Site Infections
SWI: Superficial Wound Infection

Article at a glance

Study Purpose: Investigate surgeon experience impact on appendectomy outcomes.

Key Findings: Laparoscopic appendectomy associated with shorter operative time and lower complication rates compared to open appendectomy.

Newer Findings Added: Surgeon experience significantly influences operative outcomes, highlighting importance of proficiency in surgical techniques.

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Conflict of interest: None declared

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