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COMAPRISON OF OUTCOMES IN LAPAROSCOPIC APPENDECTOMY VS OPEN APPENDECTOMY

Dr Salma Khatoon[1], Dr Zahid Mehmood[2], Dr Mariyah Anwer[3], Dr Mehwish[4], Dr Asghar Ali[5]

[1]Postgraduate Trainee R4, Department of General Surgery, Jinnah Postgraduate Medical Center Karachi
[2]Professor, Head of Department, Jinnah Postgraduate Medical Center Karachi
[3]Associate Professor, Jinnah Postgraduate Medical Center Karachi
[4]Resident Trainee R3, Jinnah Postgraduate Medical Center Karachi
[5]Resident Trainee R4, Jinnah Postgraduate Medical Center Karachi

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Corresponding Author:
Dr Salma Khatoon,

Postgraduate Trainee R4, Department of General Surgery, Jinnah Postgraduate Medical Center Karachi

Email:
balochakbarkhan@gmail.com

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ABSTRACT

Introduction: Acute appendicitis is a surgical emergency that is amongst the most frequently performed all over the globe, with open appendectomy being the conventional treatment. Laparoscopic appendectomy has become a popular practice in most centers with the introduction of the technique of minimally invasive surgery. Nevertheless, open appendectomy remains very common in low- and middle-income nations as a result of resource shortages.

Objective: To compare the incidence of postoperative outcomes such as operative time, hospital stay, complications and pain scores between laparoscopic appendectomy and an open appendectomy.

Material and Method: A prospective observational comparative study was carried out in Department of surgery, Jinnah Postgraduate Medical Center Karachi, Pakistan, from July 2024 to December 2024. One hundred patients (aged 18 years or older) having acute appendicitis were included (50 cases of laparoscopic appendectomy and 50 cases of open appendectomy). The information concerning demographic data, operative data, postoperative complications, pain measurements (VAS), and length of stay was collected and compared.

Results: The mean age of patients was 28.4 ± 10.2 in the laparoscopic group and 30.7 ± 11.5 in the open group. The laparoscopic cases took a lot less time during the operation (45.3 +/- 9.6 minutes), as compared to Open surgery cases (60.1 ± 12.8 minutes). Laparoscopic patients had a shorter length of stay (2.1 ± 0.8 days) compared with those undergoing sharp appendectomy (3.2 ± 1.1 days). The incidences of postoperative wound infections were less in the laparoscopic (6%) than in the open group (18%).

Conclusion: Laparoscopic appendectomy is more effective than open appendectomy due to decreased operating time, less operative morbidity, fewer complications, shorter stay and less postoperative pain. It should be promoted as the method of choice in surgery to be performed in tertiary care facilities in Pakistan, and work should be put into increasing the availability of laparoscopic facilities.

INTRODUCTION

Acute appendicitis is still among most common reasons of acute abdominal pain requiring surgery, and appendectomy is still one of the most commonly done emergency surgeries known globally (1). The conventional way of treating appendicitis has changed extensively over the past 100 years, where the conventional open method of appendectomy was replaced with a less invasive laparoscopic method. Although surgical practices have improved, there has been an ongoing debate about which one is superior to the other, particularly in postoperative results, complications and cost-effectiveness (2). Appendicitis is a health problem that prevails all over the world, transcends all ages and genders, and is primarily strong in males (3). The clinical presentation is indeed variable, which depends on the anatomical position of the appendix and other patient-related conditions, such that in some cases, a difficulty is encountered in its diagnosis (4). Early and proper diagnosis is essential, as delay may cause the development of complications such as perforation, peritonitis, or abscesses.

The surgical approach is the primary element that forms treatment activity, and the two most frequently applied methods, open appendectomy and laparoscopic appendectomy, have been extensively researched regarding their effectiveness and safety (5). The traditional open appendectomy that had been established by McBurney in the late 19th century dominated surgery practice until more than 100 years later (6). Although this procedure is relatively simple and efficient, it is associated with postoperative pain, long healing time, and the chance of developing wound-related complications. Conversely, laparoscopic appendectomy, which was introduced in the 1980s, has elicited popularity as a minimally invasive option (7,8). It is usually characterised by three minor trocar incisions, minimal surgical damage, improvement of postoperative recovery, and improved cosmetic result, thus being appealing to both patient and surgeon (9,10). Nonetheless, other studies have found no difference in important clinical outcomes, including complications, time of surgery or long-term outlook (11)

Indeed, open appendectomy has been found to be just as safe, at least in limited-resource settings where laparoscopic resources might not be possible (12). The current debate presents context-specific research as a necessary field to base clinical decision-making. Outcomes are also dependent on the type of appendicitis, either complicated or uncomplicated. Laparoscopic appendectomy has been found to be especially beneficial in complex cases, with abdominal visibility being an asset in detecting and controlling concomitant disease (13). However, some research has shown that there is an increased risk of intra-abdominal abscess development after laparoscopic surgical procedures compared to using the open method, which has cast doubts on its safety in particular situations (14). These results underline the fact that a possible universal standard is very complex and requires additional comparative assessments in various patient groups. The surgical technique to be used is further complicated by factors related to the patient, including the property of being obese, comorbid conditions and age. Study results have found that laparoscopic appendectomy offers superior postoperative quality of life, with fewer wound-related complications in patients with obesity and overweight, as opposed to open surgery (15).

Likewise, there is evidence that minimal invasive surgery can lead to less wound infection, a better cosmetic appearance, and faster recovery among younger patients, thus making it a recommended solution among this subgroup (16). However, the benefits of laparoscopy with reference to open surgery might not be apparent in older patients with several comorbidities (17). The surgeon's experience and the hospital's setting affect outcomes. Even conversion to open surgery cannot be avoided at times in

laparoscopic surgery due to difficulties of intraoperative anatomy or severe adhesion, and this may influence operative time and complication rates (18). Laparoscopic teams that are well-trained within the hospital environment show overall more favorable outcomes concerning laparoscopic appendectomies, whereas open appendectomies can become a better option in less experienced centers due to their equal efficacy and practicality.

Limited local evidence has demonstrated better short-term outcomes of laparoscopic surgery regarding postoperative pain and duration of hospital stay, although concerns have been raised regarding the cost-effectiveness and accessibility of laparoscopic surgery in public hospital settings (15). In contrast, open appendectomy remains common in practice, particularly because it is simpler, cheaper, and can be easily performed by general surgeons, a situation especially prevalent in district-level hospitals where laparoscopic instruments may not be available. Global literature also reflects a wide range of findings. Some research also emphasizes the importance of healthcare systems and cost structures, with laparoscopic surgery being more cost-effective in high-volume centers but potentially less so in smaller hospitals (10). The choice between the two is often influenced by patient characteristics, disease complexity, hospital resources, and surgeon expertise.

Objective: To compare the two groups of laparoscopic appendectomy and open appendectomy regarding the results of outcomes in the adult patients with acute appendicitis in the tertiary care hospital in Pakistan.

MATERIALS AND METHODS

Study Design: Prospective observational comparative study

Study setting: Department of surgery, Jinnah Postgraduate Medical Center Karachi, Pakistan.

Duration of Study: From July 2024 to December 2024**.**

Sample Size: The study included one hundred patients (18 years and above) diagnosed with acute appendicitis and subjected to appendectomy. There were fifty patients who had a laparoscopic appendectomy and fifty who had an open appendectomy patient.

Inclusion Criteria: Patients who were aged 18 years and above presenting with a clinical diagnosis of acute appendicitis were included. This was diagnosed as a result of right lower quadrant abdominal pain during examination, leukocytosis with WBC count >11000/ uL, and appendiceal inflammation identified on ultrasound examination or CT scan. Complicated and uncomplicated cases of acute appendicitis were both deemed to be candidates for surgical care through either technique.

Exclusion Criteria: Patients with a perforated appendix or an appendicular abscess/ lump were excluded. Previous abdominal surgery, comorbidity, e.g. cirrhosis, coagulation disorders, psychiatric illness or hemodynamic instability necessitating intensive care were also excluded. The study excluded pregnant women, women with diabetes (because of the confounding risk of wound infection), women with an ASA of III or greater, and other potential confounding risks to facilitate surgical safety**.**

Methods

Patients were admitted to the emergency department following the clinical and radiological diagnoses of acute appendicitis. Preoperative informedness consisted of standard blood tests and X-rays. All of the participants gave written informed consent. The patients were selected randomly to the laparoscopic or open appendectomy group. The two procedures were undertaken by consultant surgeons with a minimum of five years of surgical experience, under general anesthesia. In a laparoscopic appendectomy, three ports were used: a 10-mm umbilical

port, a 5-mm suprapubic port, and a 5-mm lower quadrant port. Pneumoperitoneum was established, and the endobag made of a glove was used to retrieve the appendix. A standard McBurney incision was used to carry out an open appendectomy. Ceftriaxone and metronidazole, which are prophylactic intravenous drugs, were used. The postoperative outcomes were duration of surgery, postoperative pain (rated on a Visual Analogue Scale), wound infection, seroma, paralytic ileus, bleeding, and length of hospital stay. Follow-up of patients was done up to their release date from the hospital.

RESULTS

The study population consisted of 100 patients, of whom 50 had a laparoscopic appendectomy procedure and 50 a standard open appendectomy. The male group was more represented in both groups, but there was no statistical difference in the gender proportion.

Table 1: *Demographic characteristics of patients undergoing laparoscopic versus open appendectomy*

Variable	Laparoscopic (n=50)	Open (n=50)
Mean Age (years)	28.4 ± 10.2	30.7 ± 11.5
Male, n (%)	29 (58%)	31 (62%)
Female, n (%)	21 (42%)	19 (38%)

This study showed shorter mean operative times and hospital stay for the laparoscopic group as compared to the open appendectomy group. Laparoscopic procedures averaged about 15 minutes shorter operating time and a little less than one day of hospital stay. These results are shown in Table 2.

Table 2: *Comparison of operative and hospital stay outcomes*

Outcome	Laparoscopic (n=50)	Open (n=50)
Operating time (minutes)	45.3 ± 9.6	60.1 ± 12.8
Hospital stay (days)	2.1 ± 0.8	3.2 ± 1.1

Postoperative complications were evaluated, and wound infection was significantly reduced in the laparoscopic compared to the open group. Likewise, the occurrence of seroma and paralytic ileus was lower in laparoscopic cases. Bleeding was uncommon and was not significantly different by group. These findings are summarized as shown in Table 3.

Table 3: *Postoperative complications in laparoscopic versus open appendectomy*

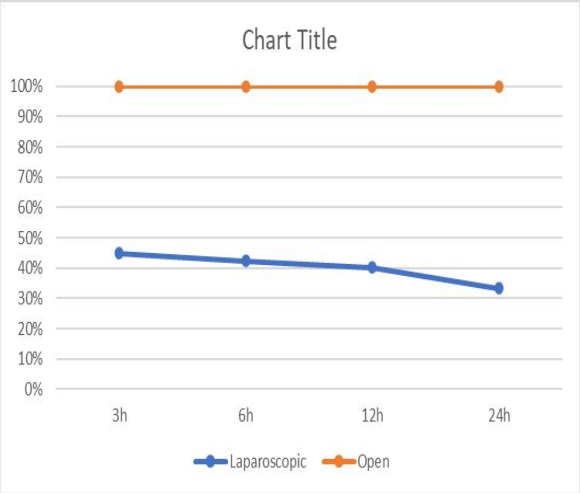
Complication	Laparoscopic (n=50)	Open (n=50)
Wound infection, n (%)	3 (6%)	9 (18%)
Seroma, n (%)	2 (4%)	5 (10%)
Paralytic ileus, n (%)	1 (2%)	4 (8%)
Bleeding, n (%)	1 (2%)	2 (4%)

The Visual Analogue Scale (VAS) was applied to pain evaluation at various postoperative times. At all time periods, the laparoscopic patients were found to record lower pain scores than the patients who underwent open surgery. This contrast was the greatest during the 24 hours, in which the laparoscopic patients experienced an average pain score that was almost half the average in the open group (Table 4).

Table 4: *Mean postoperative pain scores (VAS) in laparoscopic versus open appendectomy*

Time after surgery	Laparoscopic (Mean ± SD)	Open (Mean ± SD)
3 hours	5.8 ± 1.1	7.1 ± 1.4
6 hours	4.7 ± 1.2	6.4 ± 1.5
12 hours	3.5 ± 1.0	5.2 ± 1.3
24 hours	2.4 ± 0.9	4.8 ± 1.2

Figure 1: Demonstrates the trend of postoperative pain scores, showing a steady decline in both groups but consistently lower pain among laparoscopic patients.



Discussion

This research study was a comparison of clinical results achieved with laparoscopic and open appendectomy conducted on patients with acute appendicitis at a tertiary care hospital in Pakistan. Results demonstrated that laparoscopic appendectomy was accompanied by shorter working times, shorter hospital stays, less wound infection and seroma, and much lower postoperative pain than open appendectomy. The advantages of laparoscopic appendectomy over conventional surgery in postoperative pain and faster recovery are well documented. Ibraheem et al. (1) established that patients managed through laparoscopic appendectomy had reduced pain scores and a shorter time to resume normalcy than their counterparts managed through open surgery. Equally, Basukala et.al. (2) found out that laparoscopic surgery greatly reduced the length of hospital stay and the postoperative pain.

Another important outcome of appendectomy research is the length of hospital stay. Findings showed that laparoscopic patients were discharged an average of one day sooner than open appendicectomy patients, in line with Takami et al. (3) and Khazaal (4), who identified that minimally invasive surgery has a shorter length of hospital stay, resulting in a reduction of the economic burden on healthcare systems. Hussein et al. (5) specifically emphasised the affirmation that laparoscopic appendectomy assisted in exposure to lower complication rates and quality of life enhancements in obese patients, which once again supports findings that less invasive methods are advantageous to patients at different levels. Rates of complications are also a very important factor in the selection of the surgical method. Similarly, Sajjad and Muhammad (6,7).

These results are also supported by international data. Bhuiyan and colleagues (11) revealed a decrease in postoperative complications related to laparoscopic appendectomy in contrast to the open routine in a higher service hospital. Becker et al. (12) expanded on these findings by comparing laparoscopic and robotic appendectomy and made it clear that minimally invasive surgery increases patient outcomes in general. Similarly, Ertekin (13) demonstrated that laparoscopic appendectomy among overweight patients was associated with less surgical trauma, better quality of life, and wound healing, as we experienced a lower wound complication rate. Conversion of a laparoscopic to an open appendectomy is also a factor of consideration. Monrabal Lezama et al. (15) distinguished factors related to conversion,

such as complicated appendicitis and complications related to anatomy. Conversion was not noted in the cohort, but it is still a recognised limitation of laparoscopic surgery. Nonetheless, the literature is always inclined to note that even in complex appendicitis, laparoscopic techniques offer similar, or even better, results than open surgery (16).

Among the most commonly discussed ones is the danger of developing intra-abdominal abscesses after laparoscopic appendectomy. Guler et al. (17) and Mulita et al. (18) pointed out that although laparoscopic procedures could be associated with a slightly poorer risk of abscess in complicated appendicitis, overall, there are fewer wound complications and shorter stays in the hospital, as well as lower pain scores. The Results are consistent with the wider evidence base that laparoscopic practice is beneficial in straightforward cases, despite there being no intra-abdominal abscesses recorded in the study. The benefits of laparoscopic appendectomy are especially applicable to the situation in Pakistan, where the resources and surgical capabilities in hospitals are different. Results support the conclusion of Nazir et al. (12) and Abass et al. (13), which highlighted that laparoscopic appendectomy yields improved short-term results in healthcare settings with limited resources. Moreover, Kiril Nikolov et al. (14) supported with a literature search the same idea that laparoscopic over an open approach to appendectomy is a safe, effective, and patient-friendly method of conducting an operation with similarities to the findings of this research.

There may be practical limitations on the possible advantages of laparoscopic and open appendectomy despite the apparent benefits. The cost, laparoscopic equipment, and surgeon training opportunities are still issues in low-resource settings. Quah et al. (10) emphasised that though laparoscopic surgery has excelled in most clinical outcomes, open appendectomy has still remained crucial in settings with inadequate infrastructure. This point of view is most pertinent in the Pakistan context, where most district hospitals continue to depend on open procedures because of the costs and availability of equipment. In general, the study adds to the ever-growing evidence base indicating a better outcome of laparoscopic appendectomy than that of open appendectomy with respect to the operational efficacy, patient comfort, fewer complications, and shorter hospital stay.

Conclusion

This research showed that laparoscopic appendectomy has good results than open appendectomy in cases of patients who come with acute appendicitis to a tertiary care facility in Pakistan. Laparoscopy was associated with significantly shorter operative time, hospitalization, lower rates of wound infection and seroma, and postoperative analgesia, regardless of time periods measured. These findings are in line with the regional and international evidence that promotes minimally invasive techniques as a standard of care in appendicitis. Despite the safety and feasibility of open appendectomy and especially in resource-restricted healthcare facilities, laparoscopic appendectomy has evident clinical benefits that improve patient recovery, comfort, and reduce morbidity associated with complications. Laparoscopic methods need to be widened in use in Pakistan, with an investment in surgical training and the development of surgical facilities to promote equitable access to opportunities. Overall, laparoscopic appendectomy is an efficient, non-harmful, and patient-oriented surgical practice that must be considered a priority whenever possible.

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