https://doi.org/10.29309/TPMJ/2024.31.02.7772

The Professional Medical Journal
www.theprofesional.com
2024, Volume, 31 Issue, 02

ORIGINAL ARTICLE

# Comparison of post operative pain between open and laparoscopic appendectomy in acute appendicitis.

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**Article Citation:** Ali M, Ghayasuddin M, Wahb, Islam P, Zakir, Ali Z, Abid K. Comparison of post operative pain between open and laparoscopic appendectomy in acute appendicitis. Professional Med J 2024; 31(02):144-149. https://doi.org/10.29309/TPMJ/2024.31.02.7772

**ABSTRACT… Objective:** To compare post-operative pain between open and laparoscopic appendectomy in patients diagnosed with appendicitis presenting at a tertiary care hospital, Karachi, Pakistan. **Study Design:** Observational study. **Setting:** Department of Surgery, Kulsoom Bai Valika Hospital, Karachi, Pakistan. **Period:** January 2023 to June 2023. **Material & Methods:** The study included patients aged above 18 years of both genders, diagnosed with acute appendicitis based on ultrasound or CT scan. The decision regarding the surgical procedure was made by the surgeon team on call according to their experience and preference. Patients were divided into two groups, i.e., open appendectomy (OA) and laparoscopic appendectomy (LA). Pain in both groups was assessed at 12 hours and 24 hours after surgery using visual analogue scale. **Results:** The LA group had a mean age of 38.94±7.90 years, while the OA group had a mean age of 40.92±8.37 years. The mean BMI in the LA group was 36.75±8.50 kg/m$^2$, and in the OA group, it was 37.56±6.22 kg/m$^2$. When evaluating pain scores at the 12th (4.62±2.01 vs 5.28±1.91, p=0.027) and 24th hours (3.08±1.49 vs 3.64±1.61, p=0.017), the LA group exhibited lower pain scores compared to the OA group. **Conclusion:** As compared to OA, LA is superior approach in terms of post-operative pain in patients with acute appendicitis.

**Key words:** Appendicitis, Acute Appendicitis, Appendectomy, Post-operative Pain.

## INTRODUCTION

Worldwide, appendicitis is a prevalent and significant abdominal emergency among different age groups.[1] It is estimated that approximately 7% to 10% of the general population will encounter an episode of acute appendicitis during their lifetimes. Additionally, approximately 9% of the males and 7% of the females have the lifetime risk of developing appendicitis.[1,2]

Historically, the conventional method for managing appendicitis involved a standard right lower quadrant incision to access and remove the inflamed appendix. This technique, proposed by Charles in 1889 and 1894, has demonstrated effectiveness with lower complication rates.[1] However, it comes with drawbacks such as larger incisions, heightened post-operative discomfort, and extended recovery periods.[1,3]

In recent decades, an alternative to open appendectomy has emerged in the form of laparoscopic appendectomy. Introduced by Semm, this minimally invasive approach has garnered popularity due to its substantial advantages over open appendectomy.[1,4] Laparoscopic appendectomy not only facilitates diagnosis and treatment but also boasts faster recovery times, improved wound healing, earlier discharge, enhanced cosmetic outcomes, and reduced post-operative pain. Nonetheless, this method is not exempt from disadvantages, including higher costs and longer surgical durations.[1,3]

The choice between laparoscopic and open appendectomy remains a contentious topic within the surgical community, given the unique merits and drawbacks of each approach. While laparoscopic appendectomy offers

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**Article received on:** 19/08/2023
**Accepted for publication:** 24/10/2023

numerous benefits, it might not be universally suitable, and open appendectomy could remain preferable in specific cases.[1,4-7] Despite numerous studies comparing the outcomes of open and laparoscopic appendectomy, there is no consensus on which approach is superior in terms of post-operative pain management.[1,3-7] While some studies have reported lower post-operative pain with laparoscopic appendectomy, others have identified no significant disparity between the two techniques.[1,5,8] Therefore, the objective of this research paper is to do a comparison of post-operative pain between open and laparoscopic appendectomy in patients diagnosed with acute appendicitis presenting at a tertiary care hospital, Karachi, Pakistan. The findings of this study will contribute to the existing knowledge and potentially offer evidence-based guidance to surgeons when deciding on the most suitable surgical technique for appendicitis, ultimately refining patient care and optimizing post-operative recovery.

## MATERIAL & METHODS

This observational study was conducted within the Department of Surgery at Kulsoom Bai Valika Hospital in Karachi, Pakistan, spanning from January 2023 to June 2023. The sample size estimation was done using PASS sample size calculator. Sample size of 86≈90 in each group was estimated, by taking statistics of mean pain score in open appendectomy as 3.45 ± 1.05[9] and in laparoscopic appendectomy as 3.01 ± 1.00[9], along with an 80% power of the test and a 95% confidence level. The study included individuals aged over 18 years, regardless of gender, with a confirmed acute appendicitis diagnosis from ultrasound or CT scan. Exclusions comprised patients with cirrhosis, hemodynamic instability, coagulation disorders, psychiatric illnesses, pregnant females, and smokers. Sample selection adhered to a non-probability consecutive sampling technique.

Ethical approval was obtained from the ERC committee of the institute, and written informed consent was acquired from patients or their caregivers. The choice of surgical procedure was made by the on-call surgical team based on their experience and preference. The participants were categorized into two groups: open appendectomy (OA) and laparoscopic appendectomy (LA). Pertinent data, including age, gender, BMI, and comorbidities like hypertension and diabetes, were recorded.

Patients in both groups received a single dose of IV prophylactic ceftriaxone (1 g) and metronidazole (400 mg) perioperatively, with the same doses maintained for five days postoperatively as per protocol. In the open approach, the procedure began with a lower midline laparotomy to facilitate the appendectomy. Following the procedure, the abdominal area was cleansed using normal saline and subsequently closed, leaving the skin accessible. In the laparoscopic approach, a three-port technique was employed to create a pneumoperitoneum, facilitating laparoscopic appendectomy. The appendix was carefully placed within a specimen bag crafted from a glove to minimize any potential spillage. Subsequently, the abdominal area underwent a thorough cleansing with normal saline.

Postoperative pain levels were assessed using the visual analogue scale at 12 and 24 hours after surgery for both groups. Patients were discharged once they could tolerate a diet and remained vitally stable for 24 hours. The duration of hospital stays was documented for both groups. Additionally, patients were subjected to a follow-up in the outpatient department after 7 days to evaluate complications such as wound infection, nausea and vomiting, intraperitoneal infection, and mortality.

Statistical analysis was carried out employing SPSS version 23. Numeric variables, such as age, BMI, duration of hospital stay, and pain scores, were subjected to mean and standard deviation calculations. Categorical variables, including gender, comorbidities, and post-operative complications, were analyzed for frequency and percentage. The comparison of age, BMI, duration of hospital stay, and pain scores between the two groups was performed using independent samples t-test. Gender, comorbidities, and post-operative complications

were compared between groups using the Chi-square or Fisher exact test. Patients necessitating a conversion from laparoscopic to open appendectomy were excluded from the analysis. The level of significance was established at 5%.

## RESULTS

A total of 180 cases were included, with 90 individuals undergoing OA and another 90 undergoing LA. However, during the procedure, three patients initially planned for LA had to be converted to OA, and thus, these three cases were excluded from the analysis.

The LA group had a mean age of 38.94±7.90 years, while the OA group had a mean age of 40.92±8.37 years. The mean BMI in the LA group was 36.75±8.50 kg/m$^2$, and in the OA group, it was 37.56±6.22 kg/m$^2$. The majority of patients in both groups were male. In the LA group, 26.4% of patients had diabetes and 17.2% had hypertension. On the other hand, in the OA group, 22.2% had diabetes, and 14.4% had hypertension. Statistical analysis revealed no significant differences in the baseline characteristics between the two groups, with a p-value>0.05.

When evaluating pain scores at the 12th and 24th hours, the LA group exhibited lower pain scores compared to the OA group. This difference was statistically significant between the groups (Table-II). Furthermore, patients in the OA group required more doses of pain medication within 2 days of surgery when compared to patients in the LA group.

In the LA group, hospital stay was significantly shorter than OA group (2.39±0.65 days vs. 3.06±0.69 days) the OA group with a p-value of 0.001.

In LA group, wound infection was found in 3 cases (3.4%), whereas in OA group, it was found in 8 cases (8.9%), respectively. Additionally, nausea and vomiting were observed in 2 (2.3%) cases in the LA group and 3 (3.3%) cases in the OA group. There was statistically insignificant observed in incidence of wound infection and nausea and vomiting between groups with

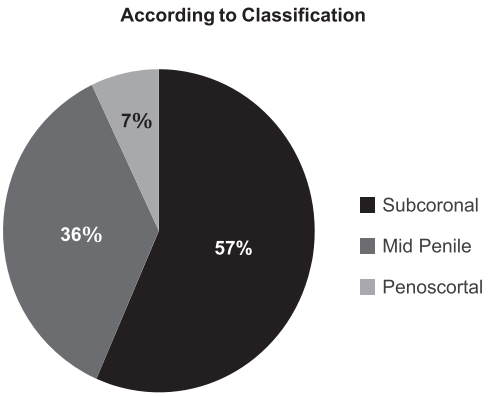


**Figure-2: Type of Hypospadias**

p-value>0.05. Furthermore, there were no cases of intraperitoneal infection or mortality in either group.

| | Groups | | P-Value |
|---|---|---|---|
| | LA (n=87) | OA (n=90) | |
| **Age (years)** | 38.94±7.90 | 40.92±8.37 | 0.108 |
| **BMI (kg/m$^2$)** | 36.75±8.50 | 37.56±6.22 | 0.470 |
| **Gender** | | | |
| Male | 46 (52.9%) | 59 (65.6%) | 0.086 |
| Female | 41 (47.1%) | 31 (34.4%) | |
| **Comorbids** | | | |
| Diabetes | 23 (26.4%) | 20 (22.2%) | 0.513 |
| Hypertension | 15 (17.2%) | 13 (14.4%) | 0.610 |

**Table-I. Comparison of baseline characteristics between groups**

| Pain | Groups | | P-Value |
|---|---|---|---|
| | LA (n=87) | OA (n=90) | |
| At 12 hours | 4.62±2.01 | 5.28±1.91 | 0.027 |
| At 24 hours | 3.08±1.49 | 3.64±1.61 | 0.017 |

**Table-II. Comparison of pain score at 12$^{th}$ and 24$^{th}$ hour between both groups**

## DISCUSSION

The best treatment for acute appendicitis is still a topic of debate among many surgeons. Most of the surgeons are considering LA for the management of acute appendicitis over open appendectomy due to its benefits.[10]

In the present study, the mean age of patients in the OA group was 40.92±8.37 years, while in the LA group, it was 38.94±7.90 years. These findings align with previous research conducted by Nazir et al., who reported a mean age of 34 ± 7 years in the OA group and 32 ± 7 years in

the LA group.[1] Similarly, Kumar et al. observed a mean age of 32.51±16.08 years in the LA group and 35.28 ± 19.46 years in the OA group.[9] Additionally, Nicholson et al. reported mean ages of 36.3 ± 18.2 years in the LA group and 37.5 ± 16.9 years in the OA group.[4] These consistent age patterns might be attributed to the higher occurrence of appendicitis in individuals of this age group. A recent meta-analysis also supported these findings, revealing that 50% of patients with acute appendicitis fell within the mean age range of 26 to 38 years.[11]

In the current study, mean hospital stay was significantly shorter in the LA group as compared to OA group (2.39±0.65 days vs 3.06±0.69 days) with p-value-0.001. Tiwari et al. also reported shorter hospital stay in the OA group as compared to LA group (4.34 ± 4.84 days vs 7.31 ± 9.34 days, p=0.001).[12] Mohamed et al. in their study found that mean hospital stay was 5.3 ± 2.1 days in LA and 7.2 ± 3.2 days in OA.[13] Bionidi et al. and Lin et al. also reported shorter hospital stay in LA group as compared to OA.[14,15] Nazir et al. reported the mean hospitalization was similar in both groups (LA=4.38 ± 1.09 days and OA=4.18 ± 0.77 days).[1]

In the current study, when evaluating pain scores at the 12th and 24th hours, the LA group exhibited lower scores compared to the OA group. This difference was statistically significant between the groups. Furthermore, patients in the OA group required more doses of pain medication within 2 days of surgery when compared to patients in the LA group. We also observed lower rate of complications in LA group as compared to OA group. Koirala et al. demonstrated that laparoscopic appendectomy offers less postoperative pain as compared to open appendectomy.[16] In the study by Surya et al. found that LA is beneficial in terms of shorter hospital stay as well as less post-operative pain as compared to OA for acute appendicitis.[17] Dwivedy et al. also found that LA is better as compared to OA in terms of post-operative pain, post-operative complications, hospital stay, early return to normal activity, and subjective cosmesis.[18] Similarly, El-Maksood et al., Hayat et al., and Sarkan et al. also concluded that LA in beneficial in terms of a short hospitalization, decreased pain following surgery, and an early return to work.[19-21] Hence, the findings highlight the potential for reduced pain medication requirements and associated side effects in the laparoscopic approach, aligning with the current study's observations.

However, our study has certain limitations that should be considered when interpreting the results. The retrospective design may introduce selection bias, and the small sample size from a single center limits the generalizability of findings. Longer-term outcomes and factors like surgeon expertise were not assessed. Pain assessment is subjective and can be influenced by reporting biases. Surgical outcomes can vary based on surgeon skill. Our study focused on post-operative pain and hospital stay, without considering costs or patient satisfaction. Despite these limitations, our findings align with existing research on the benefits of laparoscopic appendectomy for acute appendicitis. Further studies with larger sample sizes, longer follow-up, and broader outcome assessments are necessary for a comprehensive evaluation of OA and LA approaches.

## CONCLUSION

As compared to OA, LA is superior approach in terms of post-operative pain in patients with acute appendicitis.



## REFERENCES

1. Nazir A, Farooqi SA, Chaudhary NA, Bhatti HW, Waqar M, Sadiq A. **Comparison of open appendectomy and laparoscopic appendectomy in perforated appendicitis.** Cureus. 2019; 11(7):e5105. DOI: 10.7759/cureus.5105.

2. Krzyzak M, Mulrooney SM. **Acute appendicitis review: Background, epidemiology, diagnosis, and treatment.** Cureus. 2020; 12(6):e8562. DOI: 10.7759/cureus.8562.

3. Shimoda M, Maruyama T, Nishida K, Suzuki K, Tago T, Shimazaki J, et al. **Comparison of clinical outcome of laparoscopic versus open appendectomy, single center experience.** Heliyon. 2018; 4(5):e00635. DOI: https://doi.org/10.1016/j.heliyon.2018.e00635.

4. Nicholson T, Tiruchelvam V. **Comparison of laparoscopic-assisted appendectomy with intracorporal laparoscopic appendectomy and open appendectomy.** Jsls. 2001; 5(1):47-51.

5. Wang D, Dong T, Shao Y, Gu T, Xu Y, Jiang Y. **Laparoscopy versus open appendectomy for elderly patients, a meta-analysis and systematic review.** BMC Surgery. 2019; 19(1):54. DOI: 10.1186/s12893-019-0515-7.

6. Özsan İ, Karabuğa T, Yoldaş Ö, Alpdoğan Ö, Aydın Ü. **Laparoscopic appendectomy versus mini-incision appendectomy in patients with lower body mass index and noncomplicated appendicitis. Gastroenterology research and practice.** 2014; 2014:138648. DOI: 10.1155/2014/138648.

7. Aydin I, Sengul I, Gungor M, Kesicioglu T, Sengul D, Vural S, et al. **Ambulatory laparoscopic appendectomy: Does the conventional approach need a reappraisal?** Cureus. 2022; 14(9):e29215. DOI: 10.7759/cureus.29215.

8. Katkhouda N, Mason RJ, Towfigh S, Gevorgyan A, Essani R. **Laparoscopic versus open appendectomy: A prospective randomized double-blind study.** Ann Surg. 2005; 242(3):439-48. DOI: 10.1097/01.sla.0000179648.75373.2f.

9. Kumar S, Jalan A, Patowary B, Shrestha S. **Laparoscopic Appendectomy Versus Open Appendectomy for Acute Appendicitis: A Prospective Comparative Study.** Kathmandu University Medical Journal. 2016;14.

10. Di Saverio S, Podda M, De Simone B, Ceresoli M, Augustin G, Gori A, et al. **Diagnosis and treatment of acute appendicitis: 2020 update of the WSES Jerusalem guidelines.** World Journal of Emergency Surgery. 2020; 15(1):27. DOI: 10.1186/s13017-020-00306-3.

11. van Randen A, Bipat S, Zwinderman AH, Ubbink DT, Stoker J, Boermeester MA. **Acute appendicitis: meta-analysis of diagnostic performance of CT and graded compression US related to prevalence of disease.** Radiology. 2008; 249(1):97-106. DOI: 10.1148/radiol.2483071652.

12. Tiwari MM, Reynoso JF, Tsang AW, Oleynikov D. **Comparison of outcomes of laparoscopic and open appendectomy in management of uncomplicated and complicated appendicitis.** Ann Surg. 2011; 254(6):927-32. DOI: 10.1097/SLA.0b013e31822aa8ea.

13. Mohamed AA, Mahran KM. **Laparoscopic appendectomy in complicated appendicitis: Is it safe?** J Minim Access Surg. 2013; 9(2):55-8. DOI: 10.4103/0972-9941.110963.

14. Lin HF, Wu JM, Tseng LM, Chen KH, Huang SH, Lai IR. **Laparoscopic versus open appendectomy for perforated appendicitis.** J Gastrointest Surg. 2006; 10(6):906-10. DOI: 10.1016/j.gassur.2005.12.012.

15. Biondi A, Di Stefano C, Ferrara F, Bellia A, Vacante M, Piazza L. **Laparoscopic versus open appendectomy: A retrospective cohort study assessing outcomes and cost-effectiveness.** World Journal of Emergency Surgery. 2016; 11(1):44. DOI: 10.1186/s13017-016-0102-5.

16. Koirala A, Gautam M, Shah S, Adhikari DC, Bhattarai AS, Kumar Yadav A. **A comparative study of laparoscopic appendectomy with open appendectomy at a Tertiary Care Hospital.** Journal of Nobel Medical College. 2022; 11(1):17-21.

17. Prakash SV, Purohit S, Sahu AV. TO **Review the outcome of laparoscopic appendicectomy versus open appendicectomy.** Global journal for research analysis. 2020;9.

18. Dwivedy P, Seth S, Sharan J, Sharma OK, editors. **Open versus laparoscopic appendicectomy in a Tertiary Care Center – A randomized controlled study.** 2020.

19. Hayat S, Riaz O, Usman M, Lodhi MFB, Khan AA. **Comparison of open versus laparoscopic appendectomy in terms of post operative pain and operative duration.** The Professional Medical Journal. 2019; 26(10):1706-11. DOI: 10.29309/TPMJ/2019.26.10.3534

20. Ibraheem M. Abd EL-Maksood MD, Adel Abdel Aziz Sayed, M.D., Mohammed MS, Raafat I. **A comparative study of laparoscopic and open appendectomy.** The Medical Journal of Cairo University. 2021; 89(March):155-61. DOI: 10.21608/mjcu.2021.153782.

21. Amer H.E. Barrawy MD, Mohamed M. Ahmed Sakran, M.Sc., A. Abdel hameed elbadwy MD, Hamed. **Is laparoscopic appendectomy superior to open appendectomy?** The Medical Journal of Cairo University. 2020; 88(September):1707-13. DOI: 10.21608/mjcu.2020.116377.

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