

COMPARATIVE STUDY ON LAPAROSCOPIC VERSUS OPEN SURGERY FOR ACUTE APPENDICITIS IN ELDERLY PATIENTS

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Abstract

Background: Acute appendicitis in elderly patients often presents atypically, leading to diagnostic delays and higher complication rates. With advancements in minimally invasive techniques, laparoscopic appendectomy is increasingly being preferred. However, its comparative advantages over traditional open surgery in elderly patients remain a subject of ongoing evaluation. **Materials and Methods:** A comparative prospective study was conducted among 80 elderly patients (age ≥ 60 years) diagnosed with acute appendicitis and undergoing either laparoscopic or open appendectomy. Patients were grouped based on the surgical approach used. Key outcomes such as duration of surgery, postoperative complications, time to ambulation, hospital stay, and wound infection rates were analyzed and compared between the two groups. Statistical analysis was performed using appropriate parametric and non-parametric tests, with significance set at $p < 0.05$. **Result:** Out of a total of 80 patients, 40 underwent laparoscopic appendectomy while 40 underwent open surgery. The laparoscopic group demonstrated significantly shorter postoperative hospital stay (mean 3.1 ± 1.2 days vs. 5.7 ± 1.5 days), earlier ambulation ($p < 0.01$), and fewer wound infections (7.5% vs. 22.5%) compared to the open surgery group. However, the mean operative time was longer in the laparoscopic group (70.2 ± 12.3 minutes vs. 56.4 ± 10.8 minutes). Overall complication rate was lower in the laparoscopic group. **Conclusion:** Laparoscopic appendectomy appears to be a safer and more effective alternative to open surgery in elderly patients with acute appendicitis, offering quicker recovery and fewer postoperative complications despite a slightly longer operative duration.

INTRODUCTION

Acute appendicitis is one of the most common causes of acute abdominal pain requiring surgical intervention. While it is predominantly seen in younger individuals, the incidence in elderly populations is steadily increasing due to prolonged life expectancy and better access to healthcare services.^[1] However, the diagnosis and management of acute appendicitis in elderly patients present unique challenges. Atypical clinical presentations, delayed reporting, and the presence of multiple comorbidities often contribute to late diagnosis, increased risk of perforation, and higher rates of postoperative morbidity and mortality in this age group.^[2,3]

Surgical management of acute appendicitis has traditionally involved open appendectomy, which remains a widely accepted and practiced approach, especially in resource-constrained settings.^[4] However, the advent and widespread adoption of

laparoscopic surgery have significantly transformed surgical practices. Laparoscopic appendectomy, with its minimally invasive approach, has been associated with several advantages including reduced postoperative pain, shorter hospital stay, earlier return to daily activities, and better cosmetic outcomes.^[5] Despite these benefits, its utility and safety in elderly patients have been debated due to concerns about longer operative times, pneumoperitoneum-related risks, and possible technical difficulties posed by intra-abdominal adhesions or altered anatomy.^[6]

Elderly patients often have a diminished physiological reserve, and any surgical intervention must aim to minimize surgical stress and complications. Therefore, selecting the most appropriate surgical approach for acute appendicitis in this vulnerable population is critical. A comparative analysis of laparoscopic versus open appendectomy in elderly patients may provide

important insights into optimizing clinical outcomes.^[7,8]

Although several studies have explored the efficacy of laparoscopic versus open appendectomy, most have been conducted in younger populations, with limited data focusing specifically on elderly patients.^[9] This study aims to fill this gap by comparing the clinical outcomes, surgical parameters, and postoperative recovery between laparoscopic and open appendectomy in elderly patients diagnosed with acute appendicitis. Through this comparative assessment, the study seeks to evaluate whether laparoscopic appendectomy provides superior outcomes in terms of safety, effectiveness, and recovery in the elderly cohort.

MATERIALS AND METHODS

This prospective comparative study was conducted at Mahadevappa Rampure Medical College, Kalaburagi, Karnataka after taking permission from the Institutional Ethics Committee. Study was conducted among 80 elderly patients aged 60 years and above who presented with clinical and radiological evidence of acute appendicitis and underwent surgical management. Based on the surgical approach employed, patients were categorized into two groups: Group A (laparoscopic appendectomy) and Group B (open appendectomy). The choice of surgical technique was determined by the operating surgeon, considering the patient's clinical status, comorbidities, and availability of resources. All patients included in the study provided informed consent for the procedure and participation in the study.

Patients with appendicular abscess, generalized peritonitis, known malignancy, previous lower abdominal surgeries, or contraindications to laparoscopy were excluded from the study. Preoperative evaluation included complete blood count, renal function tests, serum electrolytes, abdominal ultrasound, and where required, contrast-enhanced computed tomography (CECT) to confirm the diagnosis. Comorbidities such as hypertension, diabetes mellitus, ischemic heart disease, chronic obstructive pulmonary disease (COPD), and chronic kidney disease were carefully documented.

Both surgical procedures were performed under general anesthesia. In laparoscopic appendectomy, a standard three-port technique was used, with pneumoperitoneum created using CO₂ insufflation. The appendix was identified, mobilized, and excised

using endoloop or stapler, and the specimen was retrieved using a specimen bag. In open appendectomy, a right lower quadrant incision (typically McBurney's or Lanz incision) was made to access and remove the appendix. Hemostasis was ensured in both techniques, and peritoneal lavage was performed where necessary. Postoperative pain management, antibiotic use, and thromboprophylaxis protocols were standardized across both groups.

Patients were monitored postoperatively for complications such as wound infection, ileus, respiratory distress, urinary tract infection, intra-abdominal abscess, and thromboembolic events. Key outcome measures recorded included duration of surgery (in minutes), time to first oral intake (in hours), time to ambulation (in hours), length of hospital stay (in days), postoperative complications, and readmission within 30 days. Wound infection was defined based on CDC criteria, and pain scores were assessed using a Visual Analog Scale (VAS) during the first 48 hours.

Data were entered in a structured proforma and compiled using Microsoft Excel. Statistical analysis was performed using SPSS software (version 25.0). Continuous variables such as operative time and hospital stay were expressed as mean $\pm$ standard deviation and compared using the independent samples t-test. Categorical variables like the incidence of complications and wound infection were expressed as frequencies and percentages, and comparisons were made using Chi-square test or Fisher's exact test where appropriate. A p-value of less than 0.05 was considered statistically significant.

RESULTS

A total of 80 elderly patients diagnosed with acute appendicitis were equally divided into two groups: laparoscopic and open appendectomy. The groups were comparable in baseline demographic and clinical characteristics. Significant differences were observed in operative time, intraoperative blood loss, postoperative recovery time, complication rates, and length of hospital stay, favoring the laparoscopic approach in most parameters except duration of surgery.

[Table 1] demonstrates the distribution of age and gender among the laparoscopic and open surgery groups, with no statistically significant difference between them.

[Table 2] compares the distribution of pre-existing comorbidities across both groups, indicating a comparable burden of chronic illness.

Table 1: Distribution of Age and Gender.

Variable	Laparoscopic Group (n=40)	Open Surgery Group (n=40)	p-value
Age (Mean $\pm$ SD)	66.4 $\pm$ 5.2 years	67.1 $\pm$ 6.0 years	0.52
Gender (Male/Female)	24 (60.0%) / 16 (40.0%)	26 (65.0%) / 14 (35.0%)	0.64

Table 2: Distribution of Comorbidities

Comorbidity	Laparoscopic Group F (%)	Open Surgery Group F (%)	p-value
Hypertension	18 (45.0%)	21 (52.5%)	0.49
Diabetes Mellitus	14 (35.0%)	16 (40.0%)	0.65

Ischemic Heart Disease	7 (17.5%)	9 (22.5%)	0.56
COPD	4 (10.0%)	6 (15.0%)	0.49
Chronic Kidney Disease	2 (5.0%)	3 (7.5%)	0.64

[Table 3] highlights the operative characteristics, revealing significantly less blood loss in laparoscopic procedures despite longer operative duration.

Table 3: Comparison of Operative Parameters

Parameter	Laparoscopic (Mean ± SD)	Open Surgery (Mean ± SD)	p-value
Duration of Surgery (min)	70.2 ± 12.3	56.4 ± 10.8	<0.001
Intraoperative Blood Loss (ml)	45.1 ± 15.2	78.6 ± 18.9	<0.001

[Table 4] compares postoperative recovery indicators, showing faster ambulation and earlier initiation of oral intake in the laparoscopic group.

Table 4: Postoperative Recovery Parameters

Parameter	Laparoscopic Group (Mean ± SD)	Open Surgery Group (Mean ± SD)	p-value
Time to Ambulation (hours)	14.5 ± 3.2	22.3 ± 4.6	<0.001
Time to Oral Intake (hours)	12.2 ± 2.9	18.6 ± 4.1	<0.001
Postoperative Pain Score (VAS)	3.1 ± 1.0	5.8 ± 1.3	<0.001

[Table 5] demonstrates the distribution of postoperative complications across both groups, with wound infection significantly more common in the open group.

Table 5: Postoperative Complications

Complication	Laparoscopic Group F (%)	Open Surgery Group F (%)	p-value
Wound Infection	3 (7.5%)	9 (22.5%)	0.048
Ileus	2 (5.0%)	4 (10.0%)	0.40
Respiratory Complications	1 (2.5%)	3 (7.5%)	0.30
Intra-abdominal Abscess	0 (0.0%)	2 (5.0%)	0.15

[Table 6] presents the hospital stay duration and 30-day readmission rates, showing shorter admission duration in the laparoscopic group.

Table 6: Hospital Stay and Readmission

Parameter	Laparoscopic Group	Open Surgery Group	p-value
Length of Hospital Stay (days)	3.1 ± 1.2	5.7 ± 1.5	<0.001
Readmission (within 30 days)	1 (2.5%)	3 (7.5%)	0.30

[Table 7] demonstrates the intraoperative findings observed in both groups, with a comparable distribution of inflamed, gangrenous, and perforated appendicitis.

Table 7: Intraoperative Findings

Intraoperative Diagnosis	Laparoscopic Group F (%)	Open Surgery Group F (%)	p-value
Inflamed Appendix	29 (72.5%)	27 (67.5%)	0.62
Gangrenous Appendix	7 (17.5%)	8 (20.0%)	0.77
Perforated Appendix	4 (10.0%)	5 (12.5%)	0.72

[Table 8] compares the pattern of postoperative antibiotic usage, revealing similar duration of coverage between the two groups.

Table 8: Postoperative Antibiotic Usage

Antibiotic Parameter	Laparoscopic Group (Mean ± SD)	Open Surgery Group (Mean ± SD)	p-value
Duration of IV Antibiotics (days)	2.1 ± 0.8	3.5 ± 1.1	<0.001
Duration of Oral Antibiotics (days)	4.0 ± 1.2	4.2 ± 1.5	0.58

[Table 9] highlights the histopathological confirmation rates of appendicitis, with high concordance observed in both groups.

Table 9: Histopathological Diagnosis

Histopathological Finding	Laparoscopic Group F (%)	Open Surgery Group F (%)	p-value
Acute Appendicitis	35 (87.5%)	33 (82.5%)	0.54
Suppurative Appendicitis	4 (10.0%)	6 (15.0%)	0.49
Normal Appendix	1 (2.5%)	1 (2.5%)	1.00

[Table 10] assesses the association between surgical approach and overall complication rates, showing significantly fewer complications in the laparoscopic group.

Table 10: Surgical Approach vs Overall Complications

Surgical Group	Complications Present F (%)	No Complications F (%)	p-value
Laparoscopic (n=40)	5 (12.5%)	35 (87.5%)	0.041
Open Surgery (n=40)	12 (30.0%)	28 (70.0%)	

DISCUSSION

The present comparative study assessed the outcomes of laparoscopic versus open appendectomy in elderly patients with acute appendicitis.^[10] Advancing age is associated with increased perioperative risk, and the surgical approach in such patients must be cautiously chosen to optimize safety, minimize complications, and promote faster recovery. In this study, while both surgical modalities were effective in managing appendicitis, several outcome parameters clearly favored the laparoscopic approach.^[11]

Demographically, both groups were comparable in terms of age and gender distribution, ensuring that observed differences in outcomes were attributable to the surgical technique rather than confounding baseline disparities.^[12] Similarly, the distribution of comorbidities such as hypertension, diabetes, and ischemic heart disease was balanced between the two cohorts, thus minimizing bias from comorbidity-related risk stratification.^[13]

Operative duration was understandably longer in the laparoscopic group, a consistent observation in elderly patients due to technical intricacies and the requirement for precise dissection.^[14] However, this prolonged operative time was offset by significantly reduced intraoperative blood loss and fewer postoperative complications. The minimally invasive nature of laparoscopy likely contributed to less tissue trauma and a reduced inflammatory response, explaining the observed outcomes in terms of faster ambulation, earlier oral intake, and lower pain scores.^[15]

Postoperative complication rates were lower in the laparoscopic group, especially regarding wound infections and respiratory issues. This finding supports the hypothesis that reduced incision size and lesser postoperative discomfort promote early mobility and lower the risk of nosocomial+ infections, particularly relevant in elderly individuals with limited physiological reserve. Additionally, early return of bowel function and shorter hospital stays further enhanced postoperative recovery in the laparoscopic group, reducing overall hospitalization burden.^[16]

Intraoperative findings and histopathological diagnoses were comparable across groups, affirming the clinical accuracy of preoperative diagnostic workup in elderly patients regardless of the surgical technique employed. Importantly, the laparoscopic group required a shorter duration of intravenous antibiotic therapy, which may further translate into reduced drug-related adverse effects and cost-effectiveness.^[17]

This study reinforces the growing preference for laparoscopic appendectomy in the elderly, not merely on account of its cosmetic appeal, but due to tangible clinical advantages. Nevertheless, the decision to proceed with laparoscopy should remain individualized, considering the patient's cardiopulmonary reserve, presence of prior surgeries, and surgical expertise available. Limitations of this study include the modest sample size and absence of long-term follow-up on functional recovery and quality of life metrics.

CONCLUSION

Laparoscopic appendectomy is a safe and effective alternative to open surgery in elderly patients with acute appendicitis, offering the advantages of reduced postoperative complications, faster recovery, and shorter hospital stay. While the operative time may be slightly longer, the overall clinical benefits make laparoscopy a favorable choice in appropriately selected geriatric patients.

REFERENCES

1. Kumar S, Jalan A, Patowary BN, Shrestha S. Laparoscopic Appendectomy Versus Open Appendectomy for Acute Appendicitis: A Prospective Comparative Study. Kathmandu Univ Med J (KUMJ). 2016 Jul-Sept.;14(55):244-248. PMID: 28814687.
2. Kang BM, Hwang JW, Ryu BY. Single-port laparoscopic surgery in acute appendicitis: retrospective comparative analysis for 618 patients. Surg Endosc. 2016 Nov;30(11):4968-4975. doi: 10.1007/s00464-016-4840-y. Epub 2016 Mar 16. PMID: 26983434.
3. Taguchi Y, Komatsu S, Sakamoto E, Norimizu S, Shingu Y, Hasegawa H. Laparoscopic versus open surgery for complicated appendicitis in adults: a randomized controlled trial. Surg Endosc. 2016 May;30(5):1705-12. doi: 10.1007/s00464-015-4453-x. Epub 2015 Aug 15. PMID: 26275544.
4. Del Pino C, Muñoz R, Rada G. Laparoscopic versus open appendectomy for complicated appendicitis. Medwave. 2018 Dec 11;18(8):e7370. Spanish, English. doi: 10.5867/medwave.2018.08.7369. PMID: 30550534.
5. Markar SR, Blackburn S, Cobb R, Karthikesalingam A, Evans J, Kinross J, Faiz O. Laparoscopic versus open appendectomy for complicated and uncomplicated appendicitis in children. J Gastrointest Surg. 2012 Oct;16(10):1993-2004. doi: 10.1007/s11605-012-1962-y. Epub 2012 Jul 19. PMID: 22810297.
6. Augustin G, Boric M, Barcot O, Puljak L. Discordant outcomes of laparoscopic versus open appendectomy for suspected appendicitis during pregnancy in published meta-analyses: an overview of systematic reviews. Surg Endosc. 2020 Oct;34(10):4245-4256. doi: 10.1007/s00464-020-07674-6. Epub 2020 Jun 16. PMID: 32556754.
7. Zaman S, Mohamedahmed AYY, Stonelake S, Srinivasan A, Sillah AK, Hajibandeh S, Hajibandeh S. Single-port laparoscopic appendicectomy versus conventional three-port approach for acute appendicitis in children: a systematic

- review and meta-analysis. *Pediatr Surg Int.* 2021 Jan;37(1):119-127. doi: 10.1007/s00383-020-04776-z. Epub 2020 Nov 17. PMID: 33201303.
8. Thomson JE, Kruger D, Jann-Kruger C, Kiss A, Omoshoro-Jones JA, Luvhengo T, Brand M. Laparoscopic versus open surgery for complicated appendicitis: a randomized controlled trial to prove safety. *Surg Endosc.* 2015 Jul;29(7):2027-32. doi: 10.1007/s00464-014-3906-y. Epub 2014 Oct 16. PMID: 25318368.
 9. Oravsky M, Bak V, Schnorrer M. Laparoscopic versus open appendectomy in treatment of acute appendicitis. *Bratisl Lek Listy.* 2014;115(10):660-2. doi: 10.4149/bl_l_2014_127. PMID: 25573735.
 10. Wilasrusmee C, Sukrat B, McEvoy M, Attia J, Thakkinstian A. Systematic review and meta-analysis of safety of laparoscopic versus open appendectomy for suspected appendicitis in pregnancy. *Br J Surg.* 2012 Nov;99(11):1470-8. doi: 10.1002/bjs.8889. Epub 2012 Sep 21. PMID: 23001791; PMCID: PMC3494303.
 11. Wei B, Qi CL, Chen TF, Zheng ZH, Huang JL, Hu BG, Wei HB. Laparoscopic versus open appendectomy for acute appendicitis: a metaanalysis. *Surg Endosc.* 2011 Apr;25(4):1199-208. doi: 10.1007/s00464-010-1344-z. Epub 2010 Sep 17. PMID: 20848140.
 12. Xu AM, Huang L, Li TJ. Single-incision versus three-port laparoscopic appendectomy for acute appendicitis: systematic review and meta-analysis of randomized controlled trials. *Surg Endosc.* 2015 Apr;29(4):822-43. doi: 10.1007/s00464-014-3735-z. Epub 2014 Aug 9. PMID: 25106718.
 13. Zaninotto G, Rossi M, Anselmino M, Costantini M, Pianalto S, Baldan N, Pizzato D, Ancona E. Laparoscopic versus conventional surgery for suspected appendicitis in women. *Surg Endosc.* 1995 Mar;9(3):337-40. doi: 10.1007/BF00187781. PMID: 7597610.
 14. Bruwer F, Coetzer M, Warren BL. Laparoscopic versus open surgical exploration in premenopausal women with suspected acute appendicitis. *S Afr J Surg.* 2003 Nov;41(4):82-5. PMID: 14768141.
 15. Olmi S, Magnone S, Bertolini A, Croce E. Laparoscopic versus open appendectomy in acute appendicitis: a randomized prospective study. *Surg Endosc.* 2005 Sep;19(9):1193-5. doi: 10.1007/s00464-004-2165-8. Epub 2005 Jul 28. PMID: 16132334.
 16. Tsai CC, Lee SY, Huang FC. Laparoscopic versus open appendectomy in the management of all stages of acute appendicitis in children: a retrospective study. *Pediatr Neonatol.* 2012 Oct;53(5):289-94. doi: 10.1016/j.pedneo.2012.07.002. Epub 2012 Sep 1. PMID: 23084720.
 17. 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 Surg.* 2019 May 28;19(1):54. doi: 10.1186/s12893-019-0515-7. PMID: 31138196; PMCID: PMC6540400.