

Original Research Article

A prospective study to compare laparoscopic appendicectomy versus open appendicectomy in acute appendicitis

Vikram Lalaso Patil*, Ajay Subhedar, Parvez Mujawar

Department of General Surgery, Shri Bhausaheb Hire Govt. Medical College and Hospital, Dhule, Maharashtra, India

Received: 19 August 2026

Accepted: 18 September 2026

*Correspondence:

Dr. Vikram Lalaso Patil,

E-mail: dumbmed@gmail.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: Acute appendicitis is among the commonest surgical emergencies, and while laparoscopic appendicectomy (LA) has gained favour for its reported postoperative benefits, open appendicectomy (OA) remains widely practised, particularly in resource-constrained teaching hospitals. Comparative outcome data from such settings remain limited.

Methods: This prospective comparative study was conducted at a tertiary care teaching hospital over 18-24 months in 167 patients with confirmed acute appendicitis, of whom 44 underwent LA and 123 underwent OA based on clinical presentation and surgeon judgement. Operative duration, postoperative pain, time to oral intake, hospital stay, complications, recovery status, cosmetic outcome and sequelae were recorded and compared descriptively.

Results: Both groups were predominantly young adults. The LA group had a more balanced sex distribution than the OA group, which showed male predominance. Operative duration was similar between groups. LA patients resumed oral intake earlier and were discharged sooner than OA patients, and reported better cosmetic outcomes. Complication and recovery profiles were broadly comparable between the two groups; with scar pain the only sequela recorded at follow-up.

Conclusions: Both LA and OA were associated with acceptable postoperative outcomes in this cohort. LA was associated with earlier oral intake, shorter hospital stays and better cosmesis, while operative duration and recorded complication rates were broadly comparable between the two techniques.

Keywords: Acute appendicitis, Laparoscopic appendicectomy, Open appendicectomy, Postoperative outcome, Minimally invasive surgery

INTRODUCTION

Acute appendicitis is one of the commonest causes of the acute abdomen and a leading indication for emergency abdominal surgery, with a lifetime risk estimated at 7-8% and peak incidence in the second and third decades of life.¹ Untreated, luminal obstruction and bacterial proliferation within the appendix can progress to gangrene, perforation and peritonitis, making timely surgical management essential.¹ Open appendicectomy (OA), systematised through the right iliac fossa incision described by McBurney, was for over a century the unchallenged standard of care.² A shift toward minimally invasive management began in 1983 when Semm introduced

laparoscopic appendicectomy (LA), which permits panoramic exploration of the abdominal cavity and has since gained wide acceptance with improvements in equipment and surgeon expertise.³

Meta-analyses of randomised trials have associated LA with reduced wound infection, shorter postoperative stay, and earlier return to normal activity compared with OA, although operating time is consistently longer with the laparoscopic approach.^{4,5} Much of this evidence originates from high-resource settings, and prospective comparative data from tertiary teaching hospitals in resource-constrained regions remain comparatively limited. This study was undertaken to prospectively compare LA and

OA in patients with acute appendicitis at a tertiary care teaching hospital, with respect to operative duration, postoperative recovery, hospital stay, complications, cosmetic outcome and sequelae.

METHODS

Study design and setting

This was a prospective comparative study conducted in the Department of Surgery at a tertiary care teaching hospital over a period of 18-24 months, following approval from the institutional ethics committee.

Study population and eligibility criteria

Patients presenting with a clinical diagnosis of acute appendicitis, supported by a raised total leukocyte count and/or ultrasonographic or computed tomographic findings, were considered for inclusion. Patients unwilling to provide informed consent, those managed conservatively, and those presenting with appendicular mass, abscess or perforation were excluded, as these represent a distinct clinical and management pathway. Eligible patients were recruited consecutively, and written informed consent was obtained from all participants in their vernacular language before the procedure, risks and alternatives were explained.

Group allocation

Patients underwent either LA or OA based on clinical presentation, surgeon assessment and patient factors rather than formal random assignment, resulting in unequal group sizes: 44 patients underwent LA and 123 underwent OA. This non-random allocation is acknowledged as a limitation of the study design and is addressed further in the Discussion.

Preoperative evaluation and antibiotic prophylaxis

All patients underwent detailed history-taking, abdominal examination, total leukocyte count estimation and abdominal ultrasonography, with computed tomography reserved for equivocal cases. A single intravenous dose of ceftriaxone was administered at induction of anaesthesia, followed by two further doses at 12-hour intervals.

Surgical technique

LA was performed under general anaesthesia using a standard three-port technique, with the specimen retrieved in a protective bag. OA was performed under general or spinal anaesthesia, per anaesthetic assessment, through a conventional right lower quadrant incision.

Duration of surgery was recorded from skin incision to skin closure, and any intraoperative complications or conversion to open surgery were documented.

Postoperative care and outcome assessment

Postoperative pain was assessed twice daily for the first two postoperative days using the visual analogue scale (0-10). Time to initiation of oral diet, duration of hospital stays, and postoperative complications - including wound infection, wound dehiscence, fever and ileus - were recorded. Cosmetic outcome of the suture line was graded as average or poor at follow-up.

Follow-up

Patients were reviewed in the outpatient department at 7±2 days and 6±1 weeks postoperatively for wound healing, resumption of daily activity, return to work, and late sequelae such as scar pain or lump formation.

Statistical analysis

Data were entered into a structured proforma. Continuous and categorical variables are expressed as frequencies and percentages within predefined categories. Comparisons between groups in this dataset were descriptive; formal inferential statistical testing was not performed, and no significance values are reported.

RESULTS

A total of 167 patients were enrolled, of whom 44 (26.3%) underwent LA and 123 (73.7%) underwent OA. Both groups were predominantly composed of patients aged 30 years or younger, consistent with the recognised age distribution of acute appendicitis. Sex distribution differed between the two groups: the LA group showed a near-equal split between sexes, whereas the OA group showed a clear male predominance.

Operative duration was similar between the two surgical approaches, with the majority of procedures in both groups completed within 60-75 minutes and a further substantial proportion requiring 75-120 minutes (Table 1). Postoperative pain scores were mild to moderate in both groups, with a somewhat larger proportion of OA patients reporting the lower pain band (VAS 3-5) compared with LA (Table 1). LA patients tended to resume oral intake earlier than OA patients, and a correspondingly larger proportion of the LA group was discharged within 3-5 days, whereas prolonged hospital stay beyond 5 days was more frequent in the OA group (Table 1).

Postoperative complications and recovery status are summarised in Table 2. Complication rates were broadly comparable between the two groups, with a marginally higher proportion recorded in the LA arm; recovery was uneventful in the majority of patients in both groups. Cosmetic outcome favoured the LA group, with a higher proportion rated as average and a correspondingly lower proportion rated poor compared with OA (Table 2).

At follow-up, scar pain was the only postoperative sequela reported in the study, with 17 patients in the LA group and 41 patients in the OA group reporting scar pain. No major long-term postoperative complications were recorded (Table 3).

Table 1: Operative duration, postoperative pain, time to oral intake and hospital stay by type of surgery.

Parameters	Category	LA, N (%)	OA, N (%)
Duration of surgery (min)	45-60	12 (27.3)	33 (26.8)
	60-75	18 (40.9)	49 (39.8)
	75-120	14 (31.8)	41 (33.3)
Postoperative pain (VAS)	3-5	31 (70.5)	100 (81.3)
	5-7	13 (29.5)	23 (18.7)
Time to oral intake (hours)	12-24	33 (75.0)	81 (65.9)
	24-36	11 (25.0)	42 (34.1)
Hospital stays (days)	0-3	6 (13.6)	26 (21.1)
	3-5	36 (81.8)	84 (68.3)
	5-7	2 (4.5)	13 (10.6)

Table 2: Postoperative complications, recovery status and cosmetic outcome by type of surgery.

Parameters	Category	LA, N (%)	OA, N (%)
Complications	Absent	27 (61.4)	82 (66.7)
	Present	17 (38.6)	41 (33.3)
Recovery	Uneventful	27 (61.4)	82 (66.7)
	Delayed	17 (38.6)	41 (33.3)
Cosmetic outcome	Average	35 (79.5)	86 (69.9)
	Poor	9 (20.5)	37 (30.1)

Table 3: Postoperative sequelae according to type of surgery.

Sequela	LA, N (%)	OA, N (%)
Scar pain	17 (100.0)	41 (100.0)

DISCUSSION

This prospective comparative study of 167 patients with acute appendicitis found that LA was associated with earlier oral intake, shorter hospital stays and better cosmetic outcome than OA, while operative duration and complication rates were broadly similar between the two techniques - a pattern broadly, though not entirely, consistent with the wider trial evidence.

The predominance of young adult patients in both groups mirrors the recognised epidemiology of appendicitis. The male preponderance in our OA group is consistent with Biondi et al, who similarly reported greater male representation in their open-surgery cohort (59.3%) than their laparoscopic cohort (42.7%).⁵

Operative duration was comparable between approaches here, which contrasts with the pooled trial evidence: Sauerland et al's meta-analysis of 67 RCTs found LA took 10 minutes longer than OA, and Katkhouda et al's double-blind trial found an even larger gap (80 vs 60 minutes).^{4,6} Dai and Shuai similarly found LA significantly longer overall, though they suggested the gap may narrow with growing surgical experience.⁷ The comparable operative times in our cohort may reflect differences in surgical expertise, case selection, operative protocols or local practice; however, these factors were not formally evaluated.

Postoperative pain in our cohort was mild to moderate in both groups, with a somewhat larger proportion of LA patients reporting the higher pain band than OA - running against Sauerland et al, who found LA reduced day-1 pain by 8mm on a 100 mm visual analogue scale across nearly 6,000 patients, while cautioning that most contributing trials were unblinded and the clinical relevance of so small a difference is debatable.⁴ Katkhouda et al's double-blind trial found no significant pain difference at all, attributing this to blinding removing the expectation bias present in open trials.⁶ Our finding may reflect similar unblinded-versus-blinded variation, differences in analgesic protocol, or a local learning curve, and should be read cautiously given the absence of formal statistical testing in this dataset.

Earlier oral intake and shorter hospital stay in the LA group follow the dominant trend in the literature. Sauerland et al found hospital stay reduced by 1.1 days and return to normal activity by 5 days with LA.⁴ Biondi et al reported earlier bowel movements (93% versus 69% by postoperative day one), earlier liquid-diet tolerance (85% versus 62% within 24 hours), and shorter hospital stay (1.4 versus 2.7 days) with LA.⁵ Li et al, pooling 44 trials and 5,292 patients, found a smaller but still significant 0.60-day stay reduction.⁸ Ingraham et al, across 222 hospitals, reported lower overall morbidity (4.5% versus 8.8%) and lower surgical site infection (3.3% versus 6.7%) with LA.⁹ Recovery was uneventful in most patients in both of our groups, with a similar proportion experiencing delayed recovery.

Complication rates in our study were broadly comparable, with a marginally higher proportion in the LA arm; given the smaller LA sample size, this warrants caution rather than being read as a genuine safety signal. This actually sits close to Sauerland et al's pooled result, which found wound infection roughly halved after LA but intra-abdominal abscess nearly doubled (OR 1.87) - a genuine trade-off between complication types rather than a uniform LA advantage.⁴ Markides et al, focusing on complicated appendicitis, similarly found LA reduced surgical site infection with no significant abscess-rate difference, while Ingraham et al found the reverse for one specific complication - organ-space infection was significantly more common after LA in complicated disease (6.3% versus 4.8%).^{9,10} The complication profile of LA is

therefore not uniformly favourable and depends on which complication is measured and disease severity - a nuance our own descriptive dataset, with small numbers in each arm, cannot resolve.

Cosmetic outcome favoured LA, consistent with smaller port-site incisions versus the larger right iliac fossa incision of OA. Masoomi et al, in obese patients specifically, reported lower wound infection and overall complication rates with LA in both non-perforated (7.2% versus 11.7%) and perforated appendicitis (22.3% versus 34.7%).¹¹ Shaikh et al similarly reported lower analgesic requirement, shorter hospital stay, and earlier return to work with LA, though wound infection rates did not differ significantly in their series.¹² Scar pain was the only postoperative sequela reported in the available follow-up data, and no major long-term postoperative complications were recorded.

Long-term outcome data for LA versus OA remain scarce generally - Sauerland et al note that follow-up in most included trials was limited to the immediate postoperative period, with hernia and adhesion-related data largely absent.⁴ Where longer follow-up has been undertaken, findings are reassuring: a randomised trial with three years of follow-up found no significant difference in inguinal hernia rates between OA and LA (6.6% versus 2.6%, $p=0.442$).¹³ Our own follow-up was limited to the standard postoperative period.

Limitations

This study has notable limitations. Allocation to LA or OA was not formally randomised, resulting in markedly unequal group sizes (44 versus 123) and potential selection bias, since technique choice was influenced by clinical presentation and surgeon judgement rather than random assignment - a weakness Sauerland et al note recurs across the wider trial literature, where even nominally randomised studies frequently lacked adequate allocation concealment or blinding.⁴

The single-centre design and the absence of formal inferential statistical testing in the source dataset further limit the conclusions that can be drawn, and the differences reported here should be regarded as descriptive rather than confirmatory. Larger, adequately powered, ideally randomised and blinded studies from similar resource-constrained settings are needed to confirm whether the advantages seen in the predominantly high-income trial literature generalise to this context.

In this prospective comparative cohort, LA was associated with earlier oral intake, shorter hospital stays and a more favourable cosmetic assessment outcome than OA, while operative duration and the recorded postoperative complication profile were broadly comparable. Given the non-random treatment allocation, unequal group sizes and absence of inferential statistical testing, these findings should be interpreted cautiously.

CONCLUSION

Laparoscopic appendectomy was associated with earlier resumption of oral intake, shorter hospital stays, and better cosmetic outcomes compared with open appendectomy in patients with acute appendicitis. Both procedures demonstrated comparable operative duration and broadly similar postoperative complication profiles. Laparoscopic appendectomy may therefore be considered a favourable surgical approach, although further studies with larger samples and randomised allocation are required to confirm these findings.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Bhangu A, Søreide K, Di Saverio S, Assarsson JH, Drake FT. Acute appendicitis: modern understanding of pathogenesis, diagnosis, and management. *Lancet*. 2015;386(10000):1278-87.
2. McBurney C. The incision made in the abdominal wall in cases of appendicitis, with a description of a new method of operating. *Ann Surg*. 1894;20(1):38-43.
3. Semm K. Endoscopic appendectomy. *Endoscopy*. 1983;15(2):59-64.
4. Sauerland S, Jaschinski T, Neugebauer EAM. Laparoscopic versus open surgery for suspected appendicitis. *Cochrane Database Syst Rev*. 2010;(10):CD001546.
5. 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 J Emerg Surg*. 2016;11:44.
6. 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):439-50.
7. Dai L, Shuai J. Laparoscopic versus open appendectomy in adults and children: a meta-analysis of randomized controlled trials. *United European Gastroenterol J*. 2017;5(4):542-53.
8. Li X, Zhang J, Sang L, Zhang W, Chu Z, Li X, Liu Y. Laparoscopic versus conventional appendectomy: a meta-analysis of randomized controlled trials. *BMC Gastroenterol*. 2010;10:129.
9. Ingraham AM, Cohen ME, Bilimoria KY, Pritts TA, Ko CY, Esposito TJ. Comparison of outcomes after laparoscopic versus open appendectomy for acute appendicitis at 222 ACS NSQIP hospitals. *Surgery*. 2010;148(4):625-35.
10. Markides G, Subar D, Riyad K. Laparoscopic versus open appendectomy in adults with complicated appendicitis: systematic review and meta-analysis. *World J Surg*. 2010;34(9):2026-40.

11. Masoomi H, Nguyen NT, Dolich MO, Wikholm L, Naderi N, Mills S, et al. Comparison of laparoscopic versus open appendectomy for acute nonperforated and perforated appendicitis in the obese population. *Am J Surg.* 2011;202(6):733-9.
12. Shaikh AR, Sangrasi AK, Shaikh GA. Clinical outcomes of laparoscopic versus open appendectomy. *JSL.S.* 2009;13(4):574-80.
13. Malekpour Alamdari N, Besharat S, Hajimirzaie SH, Fathi M, Abbasi M, Fathi M, et al. Inguinal hernia

following open vs laparoscopic appendectomy in a three-year follow-up: a randomized controlled study. *Iran Red Crescent Med J.* 2024;26(1):e199245.

Cite this article as: Patil VL, Subhedar A, Mujawar P. A prospective study to compare laparoscopic appendicectomy versus open appendicectomy in acute appendicitis. *Int Surg J* 2026;13:2152-6.