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Research Article

Comparison of laparoscopic and open appendectomy outcomes in acute appendicitis

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ABSTRACT

Objective: This study aimed to compare the intraoperative and postoperative outcomes of laparoscopic appendectomy (LA) and open appendectomy (OA) in patients diagnosed with acute appendicitis, with a focus on surgical outcomes and recovery parameters.

Methods: A retrospective analysis was conducted on 376 patients who underwent appendectomy for acute appendicitis at İzmir City Hospital between October 15, 2023, and August 15, 2024. Patients were grouped based on surgical approach (LA or OA). Data on demographic characteristics, body mass index (BMI), operative duration, intraoperative blood loss, time to oral intake, length of hospital stay, return-to-work time, and postoperative complications were collected and analyzed. Statistical significance was defined as $p < 0.05$.

Results: Of the 376 patients, 251 underwent LA and 125 underwent OA. The mean operative duration was significantly longer in the LA group (102.56 ± 44.4 minutes vs. 85.4 ± 43.11 minutes, $p = 0.009$). However, intraoperative blood loss was significantly lower in the LA group (29.64 ± 62.97 mL vs. 74.79 ± 168.55 mL, $p = 0.018$). Postoperative pain scores (VAS) were significantly lower in LA patients, and they experienced a shorter hospital stay and faster return to work ($p < 0.001$). The incidence of wound infections was lower in the LA group compared to the OA group (5% vs. 12%, $p = 0.03$). Conversion from LA to OA occurred in 2.9% of cases due to intraoperative complications such as bleeding, perforation, or inadequate visualization.

Conclusion: Laparoscopic appendectomy demonstrated favorable postoperative outcomes compared to open appendectomy, including reduced postoperative pain, shorter hospital stays, and quicker recovery. These results support the adoption of LA as a safe and effective alternative to OA, particularly in patients with higher BMI or less severe disease presentations. Nonetheless, larger prospective randomized studies are required to confirm these findings and better define the optimal indications for LA in clinical practice.

Keywords: Acute appendicitis, Laparoscopic appendectomy, Open appendectomy, Postoperative outcomes, Minimally invasive surgery

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Introduction

Acute appendicitis is one of the most common surgical emergencies, and appendectomy is among the most frequently performed abdominal surgeries worldwide (1,2). While open appendectomy (OA) has historically been considered the standard treatment, laparoscopic appendectomy (LA) has become increasingly popular due to its potential benefits, including reduced postoperative pain, faster recovery, and cosmetic advantages (3,4). In recent years, laparoscopic surgery has become the gold standard for many surgical procedures, thanks to its minimally invasive nature. In abdominal surgery in particular, laparoscopic techniques stand out for their smaller scars, lower postoperative pain, and shorter recovery times (4,5).

Numerous studies have compared the clinical outcomes and postoperative complications of LA and OA, but the findings are mixed. While some studies report superior outcomes with LA, others have not demonstrated a clear advantage (6,7). This study aims to compare the intraoperative and postoperative outcomes of laparoscopic and open appendectomy in patients diagnosed with acute appendicitis, focusing on clinical outcomes, postoperative complications, and recovery parameters.

Methods

A retrospective analysis was conducted on 376 patients who underwent appendectomy for acute appendicitis at Izmir City Hospital between October 15, 2023, and August 15, 2024. The initial cohort of 418 patients was reduced to 376 after applying exclusion criteria, which included patients under 18 years of age, pregnant patients, those with severe sepsis or septic shock contraindicating laparoscopy, and patients with complicated appendicitis. The choice of surgical method was determined by the operating surgeon. The study was approved by the Izmir City Hospital Ethics Committee.

Data collected included demographic characteristics, comorbidities, body mass index (BMI), operative duration, intraoperative blood loss, time to initiation of oral intake, length of hospital stay, return-to-work time, and postoperative complications (wound infection, intraperitoneal infection, paralytic ileus, and mortality). Patients were monitored for 30 days postoperatively, with findings related to suture removal, dressing changes, and postoperative complications documented (Table 1).

Statistical analyses

The collected data were analyzed using IBM SPSS Statistics (v.25.0) software. Continuous variables were expressed as mean ± standard deviation (SD) or median (minimum-maximum), while categorical variables were expressed as frequency and percentage. For comparisons between groups, independent samples t-test or Mann-Whitney U test was used for continuous variables, and chi-square test or Fisher's exact test was used for categorical variables. A p-value of<0.05 was considered statistically significant.

Results

A total of 376 patients were included in the study. Of these, 251 underwent laparoscopic

Table 1. Distribution of Alvarado Score and BMI between OA and LA Groups

Variables	Total (n=376)	OA (n=251)	LA (n=125)
Mean Age (years)	38.5 (18-87)	40.6 (18-87)	34.7 (18-75)
Gender (Male/Female)	206/170 (55.6%)	151/100 (60%/40%)	75/50 (60%/40%)
Alvarado Score 9 or higher (n, %)	161 (43.6%)	125 (50%)	36 (31.2%)
Alvarado Score 8 or lower (n, %)	212 (56.4%)	126 (50%)	86 (68.8%)
Patients with BMI > 30 (n, %)	110 (29.3%)	52 (20.7%)	58 (46.4%)

Table 2. Operative and Postoperative Outcomes, Complication Rates, and Significance Values

Variables	Total (n=376)	OA (n=251)	LA (n=125)	p-value
Operative Time (minutes)	95.5 (35-180)	85.4 ± 43.11	102.56 ± 44.4	0.009
Intraoperative Blood Loss (mL)	52.2 (10-500)	74.79 ± 168.55	29.64 ± 62.97	0.018
Time to Oral Intake (days)	2.25 (1-5)	2.48 ± 2.17	2.03 ± 1.66	0.123
Postoperative Pain (VAS score)	4.5 (2-10)	5.0 ± 2.5	3.5 ± 2.2	0.044
Postoperative Vomiting (n, %)	98 (26.1%)	70 (28%)	20 (16%)	0.045
Wound Infection (n, %)	30 (8%)	30 (12%)	7 (5%)	0.03
Paralytic Ileus (n, %)	12 (3%)	12 (5%)	0 (0%)	0.012
Length of Hospital Stay (days)	3 (1-7)	3.5 ± 1.2	2.1 ± 0.9	0.016
Return-to-Work Time (days)	10.5 (6-18)	13.4 ± 3.8	8.8 ± 2.6	0.001

appendectomy (LA), and 125 underwent open appendectomy (OA). The overall mean age of the patients was 38.5 years, with the OA group having a higher mean age (40.6 years) compared to the LA group (34.7 years). The gender distribution was similar in both groups, with 60% male and 40% female representation.

Surgical selection varied based on Alvarado scores. Among patients with a score of 9 or higher, 50% were treated with OA and 31.2% with LA. Conversely, among those with a score of 8 or lower, 50% underwent OA, while 68.8% were treated with LA. LA was more frequently preferred in patients with a BMI ≥30 (46.4% vs. 20.7%).

The operative duration was significantly longer in the LA group (102.56 ± 44.4 minutes vs. 85.4 ± 43.11 minutes, p=0.009). However, LA provided the advantage of reduced intraoperative blood loss (29.64 ± 62.97 mL vs. 74.79 ± 168.55 mL, p=0.018). Postoperative pain (measured by VAS score) was lower in the LA group, and these patients had shorter hospital stays (2.1 ± 0.9 days vs. 3.5 ± 1.2 days, p=0.016). Additionally, LA patients returned to work earlier (p<0.001) and had a lower wound infection rate compared to the OA group (5% vs. 12%, p=0.03) (Table 2).

A total of 11 patients (2.9%) were converted from LA to OA. The reasons for conversion included bleeding, perforation, and insufficient exploration (Table 3).

Table 3. Conversion from LA to OA Cases

Variables	Total (n=376)
Total number of conversion cases (LA to OA)	11 (2.9%)
Due to bleeding (n, %)	3
Due to perforation (n, %)	3
Due to insufficient exploration (n, %)	5

Discussion

The findings of this study indicate that laparoscopic appendectomy (LA) can be a safe and effective alternative to open appendectomy (OA) in the treatment of acute appendicitis.

Compared to other studies in the literature, these results confirm the contributions of LA to the postoperative recovery process (6,7). In particular, the ability of LA to reduce infection risk and provide technical ease in patients with a high BMI aligns with previously reported findings (8). However, disadvantages such as the longer operative duration and higher cost associated with LA remain limitations that are also discussed in the literature (6).

Several limitations of this study should be noted. The limited sample size, particularly the relatively low number of patients in the LA group, may restrict the generalizability of the findings. Additionally, the retrospective nature of the study may introduce selection bias and issues related to incomplete data. Furthermore,

due to the short follow-up period, long-term complications could not be assessed.

Conclusion

The findings of this study demonstrate that laparoscopic appendectomy (LA) provides superior intraoperative and postoperative outcomes compared to open appendectomy (OA) in the treatment of acute appendicitis. The laparoscopic approach has proven to be a safe and effective surgical method, offering clinical advantages such as shorter hospital stays, faster return to work, and lower wound infection rates. Additionally, the laparoscopic technique has the potential to provide more accurate diagnosis and appropriate treatment in cases where definitive diagnosis is challenging.

Furthermore, LA has emerged as a preferred option for the treatment of appendicitis in overweight and obese patients due to its technical ease, reduced infection risk, and faster recovery. In light of these findings, the increasing preference for laparoscopic appendectomy highlights its potential to improve patients' quality of life and reduce postoperative complications. Moreover, patient feedback has indicated that the cosmetic advantages of laparoscopic incisions enhance patient satisfaction and the acceptability of this surgical method.

Ethical approval

The study was approved by the İzmir City Hospital Ethics Committee (date: 05.02.2025, number: 2024/166).

Author contribution

The authors confirm contribution to the paper as follows: Study conception and design: BE, ME, KEK; data collection: BE, CD, SS, ME, MG; analysis and interpretation of results: BE, ME, MG, KEK; draft manuscript preparation: BE, CD, SS. All authors reviewed the results and approved the final version of the manuscript.

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Conflict of interest

The authors declare that there is no conflict of interest.

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