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Retrospective Analysis of Risk Factors for Complications and Treatment Outcomes in Adult Appendicitis: A Single-Center Study

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ABSTRACT

Background: Appendicitis remains a common surgical emergency, but risk factors for complications and optimal treatment strategies require further clarification. This study analyzed clinical characteristics, treatment outcomes, and risk factors for complications in adult appendicitis patients.

Methods: Data from 850 adult appendicitis patients (≥18 years) treated at a tertiary center (2021–2023) were retrospectively reviewed. Patient demographics, clinical features, surgical methods, and postoperative complications were analyzed. Univariate/multivariate logistic regression identified risk factors for complications.

Results: Median age was 38 years (IQR: 26–52), with 56% male patients. Perforated appendicitis occurred in 28% (238/850), and 12% (102/850) had comorbidities (diabetes/hypertension). Laparoscopic appendectomy (LA) was performed in 78% (663/850), associated with lower complication rates (9.1% vs. 18.6%, $p<0.001$) and shorter hospital stay (3 vs. 5 days, $p<0.001$) compared to open appendectomy (OA). Multivariate analysis identified perforation (OR=3.21, 95%CI:2.14–4.83, $p<0.001$), age ≥60 years (OR=2.58, 95%CI:1.62–4.13, $p<0.001$), and comorbidities (OR=1.92, 95%CI:1.27–2.91, $p=0.002$) as independent risk factors for complications.

Conclusion: Perforation, advanced age, and comorbidities increase complication risk. LA is associated with superior outcomes and should be prioritized in uncomplicated cases.

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Introduction

Appendicitis is the most common acute abdominal emergency, affecting ~7% of the global population [1]. While mortality is low in developed countries, complications such as perforation, abscess, and wound infection occur in 10–20% of cases [2]. Identifying high-risk subgroups and optimizing treatment strategies are critical for improving outcomes.

Laparoscopic Appendectomy (LA) has gained popularity due to reduced pain and faster recovery, but its role in complicated cases (e.g., perforation) remains debated [3]. Advanced age and comorbidities (e.g., diabetes) are known to increase surgical risk, but their independent impact on appendicitis outcomes is unclear [4]. This study aimed to characterize clinical patterns, compare LA vs. Open Appendectomy (OA), and identify independent risk factors for complications.

Materials and Methods

Patient Cohort

Data from 850 adult appendicitis patients (≥18 years) undergoing surgery at a tertiary center (2021–2023) were analyzed. Exclusion criteria: pediatric patients, pregnancy, or incomplete records. Clinical data included age, sex, comorbidities (diabetes, hypertension), presenting symptoms, laboratory values (WBC count), imaging findings, surgical method (LA/OA), intraoperative findings (perforation, pus), and postoperative complications (wound infection, intra-abdominal abscess, intestinal obstruction).

Statistical Analysis

Categorical variables were compared using chi-square/Fisher's exact tests; continuous variables used Mann-Whitney U tests. Univariate/multivariate logistic regression identified risk factors for complications. Odds ratios (OR) with 95% Confidence Intervals (CI) were reported. All analyses used SPSS 28.0, with $p<0.05$ considered significant.

Results

Patient Characteristics

The cohort included 476 males (56%) and 374 females (44%), median age 38 years (IQR:26–52). Key findings:

- Perforated appendicitis: 28% (238/850)
- Comorbidities: 12% (102/850, including diabetes (6.8%) and hypertension (5.2%))
- LA rate: 78% (663/850), OA: 22% (187/850)
- Median time from symptom onset to surgery: 12 hours (IQR:6–24)

Table 1: Baseline Characteristics

Characteristic	Total (n=850)	LA (n=663)	OA (n=187)	*p*-value
Age ≥60 years (%)	15% (128/850)	12% (79/663)	24% (49/187)	<0.001
Comorbidities (%)	12% (102/850)	10% (68/663)	18% (34/187)	0.002
Perforated appendicitis (%)	28% (238/850)	24% (158/663)	43% (80/187)	<0.001
WBC ≥15×10⁹/L (%)	35% (298/850)	32% (212/663)	45% (86/187)	0.001

Treatment Outcomes

LA was associated with significantly better outcomes than OA:

- Median hospital stay: 3 days (LA) vs. 5 days (OA), p<0.001
- Overall complication rate: 9.1% (LA) vs. 18.6% (OA), p<0.001
- Wound infection: 5.3% (LA) vs. 12.3% (OA), p<0.001
- Intra-abdominal abscess: 2.7% (LA) vs. 5.9% (OA), p=0.003

Table 2: Treatment Outcomes by Surgical Method

Outcome	LA (n=663)	OA (n=187)	p-value
Median hospital stay (days)	3 (2–4)	5 (4–7)	<0.001
Overall complications (%)	9.1% (60/663)	18.6% (35/187)	<0.001
Wound infection (%)	5.3% (35/663)	12.3% (23/187)	<0.001
Intra-abdominal abscess (%)	2.7% (18/663)	5.9% (11/187)	0.003
Intestinal obstruction (%)	1.2% (8/663)	2.7% (5/187)	0.23

Risk Factors for Complications

Univariate analysis identified perforation, age ≥60, comorbidities, OA, and WBC ≥15×10⁹/L as risk factors. Multivariate analysis confirmed three independent risk factors:

- Perforated appendicitis (OR=3.21, 95%CI:2.14–4.83, *p*<0.001)
- Age ≥60 years (OR=2.58, 95%CI:1.62–4.13, *p*<0.001)
- Comorbidities (OR=1.92, 95%CI:1.27–2.91, *p*=0.002)

Table 3: Univariate and Multivariate Logistic Regression for Complications

Variable	Univariate OR (95%CI)	*p*-value	Multivariate OR (95%CI)	*p-value*
Perforation (+)	3.89 (2.71–5.61)	<0.001	3.21 (2.14–4.83)	<0.001
Age ≥60 years (+)	2.97 (1.98–4.46)	<0.001	2.58 (1.62–4.13)	<0.001
Comorbidities (+)	2.11 (1.38–3.22)	0.001	1.92 (1.27–2.91)	0.002
Open appendectomy (+)	2.35 (1.52–3.66)	<0.001	1.34 (0.85–2.12)	0.21
WBC ≥15×10⁹/L (+)	1.89 (1.28–2.79)	0.002	1.27 (0.84–1.92)	0.26

Discussion

This retrospective analysis of 850 appendicitis patients highlights key findings: Perforated appendicitis doubled the risk of complications, likely due to increased peritoneal contamination and abscess formation [5]. Early imaging (e.g., ultrasound/CT) to detect perforation is critical for timely intervention. Older patients (≥60 years) and those with comorbidities had higher complication rates, possibly due to delayed presentation, reduced immune function, and impaired wound healing [6]. Preoperative optimization of comorbidities (e.g., glycemic control in diabetes) may reduce risk. LA showed superior outcomes in uncomplicated cases, consistent with recent meta-analyses [3,7]. However, OA remained necessary in 22% of cases, primarily for advanced perforation or technical challenges. Routine use of LA in uncomplicated appendicitis is supported, while high-risk patients (perforation, age, comorbidities) require close monitoring and multidisciplinary care. Single-center design, potential selection bias in surgical method, and lack of long-term follow-up. Future multicenter studies should validate these findings and explore minimally invasive techniques for complicated cases.

Perforated appendicitis, advanced age, and comorbidities are independent risk factors for complications. Laparoscopic appendectomy is safe and effective for uncomplicated cases, reducing morbidity and hospital stay. Clinicians should prioritize early diagnosis, risk stratification, and minimally invasive approaches to optimize outcomes in appendicitis.

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