Original Article

Cukurova Anestezi ve Cerrahi Bilimler Dergisi

Pediatric Acute Appendicitis: A Retrospective Evaluation of Multidisciplinary Management in Conservative and Surgical Treatment Approaches

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Abstract

Aim: To evaluate the outcomes of conservative and surgical treatment approaches in pediatric acute appendicitis within a multidisciplinary management framework, and to investigate factors associated with treatment selection and disease severity. **Methods:** This retrospective, single-center study included 312 pediatric patients (0–18 years) diagnosed with acute appendicitis between January 2015 and January 2025. Patients were categorized into conservative (antibiotic therapy) and surgical (open or laparoscopic appendectomy) groups. Demographic, clinical, laboratory, and outcome data were analyzed. All treatment decisions were made through multidisciplinary evaluation involving pediatricians, pediatric surgeons, and radiologists. Multivariate logistic regression was used to identify predictors of complicated appendicitis. **Results:** Of the patients, 71.8% underwent surgical treatment and 28.2% were managed conservatively. The conservative group had a significantly shorter symptom duration and lower inflammatory markers ($p<0.001$). Treatment success in the conservative group was 84.1%, with a failure rate of 15.9%. Complication rates and hospital stay were higher in the surgical group ($p=0.01$ and $p<0.001$, respectively), likely reflecting higher disease severity at presentation. Symptom duration >24 hours, CRP >50 mg/L, and rebound tenderness were identified as independent predictors of complicated appendicitis. **Conclusion:** Both conservative and surgical approaches are effective in pediatric acute appendicitis when guided by appropriate patient selection. Multidisciplinary evaluation, together with clinical and inflammatory severity markers, plays a key role in treatment selection and optimization of clinical outcomes. An individualized treatment strategy based on clinical, laboratory, and radiological findings may improve patient management and support appropriate decision-making.

Keywords: Pediatric appendicitis; conservative management; appendectomy; multidisciplinary approach; complicated appendicitis

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1. Introduction

Acute appendicitis is one of the most common surgical emergencies in childhood and represents a leading cause of acute abdominal pain in the pediatric population[1,2]. The clinical presentation may vary according to age, and atypical symptoms are particularly common in younger children, often leading to diagnostic difficulties and treatment delays[2,3].

Delayed diagnosis may increase the risk of perforation, abscess formation, peritonitis, and other complications that contribute to increased morbidity and prolonged hospitalization[2,3]. Therefore, early diagnosis and appropriate treatment selection remain fundamental components of pediatric appendicitis management.

Appendectomy has traditionally been accepted as the gold standard treatment for acute appendicitis because it provides definitive management and minimizes the risk of recurrence[4,5]. However, increasing interest has emerged regarding conservative, antibiotic-based treatment strategies, particularly for patients with uncomplicated appendicitis[6,7]. Several studies have suggested that carefully selected pediatric patients may achieve favorable outcomes without surgical intervention[6–8]. Nevertheless, concerns regarding treatment failure, recurrence, and long-term effectiveness continue to be debated[7,8]. As a result, determining the most appropriate treatment approach for individual patients remains an important clinical challenge.

Accurate diagnosis relies on a combination of clinical evaluation, laboratory findings, and imaging modalities. Ultrasonography is generally considered the first-line imaging method in pediatric patients, although advanced imaging techniques may be required in selected cases[4,5]. In addition to diagnostic assessment, clinical findings and radiological evaluation play an important role in determining the most appropriate treatment strategy. In this context, a multidisciplinary approach involving pediatricians, pediatric surgeons, radiologists, and emergency physicians plays a crucial role in ensuring accurate diagnosis and optimal treatment decisions.

Complicated appendicitis, including perforation, abscess formation, and peritonitis, is associated with increased morbidity, longer hospital stay, and a higher risk of postoperative complications[3]. Early diagnosis and appropriate treatment selection are therefore essential to improve clinical outcomes. Additionally, patient-related factors such as age, duration of symptoms, clinical findings, and inflammatory markers may influence disease progression and treatment success[1,5]. Identifying these factors may facilitate risk stratification and support individualized treatment planning.

Current literature reflects a growing number of studies comparing conservative and surgical treatment strategies in pediatric acute appendicitis[6–8]. Although both approaches have demonstrated favorable outcomes in appropriately selected patients, the optimal management strategy remains controversial in certain clinical scenarios. Furthermore, treatment decisions in daily clinical practice are frequently influenced by disease severity, radiological findings, patient characteristics, and multidisciplinary clinical evaluation. Such investigations are important to better understand the factors influencing treatment selection and to optimize patient management.

The aim of this study was to retrospectively evaluate the outcomes of conservative and surgical treatment approaches in pediatric patients diagnosed with acute appendicitis within a multidisciplinary management framework. In addition, clinical and demographic factors associated with treatment selection and treatment outcomes were investigated.

2. Materials and Methods

This study was approved by the Non-Interventional Clinical Research Ethics Committee of Van Yüzyılı University (Approval No: 2026/03-54, Date: 13/03/2026). The study was conducted in accordance with the principles of the Declaration of Helsinki. It was designed as a single-center, retrospective, observational study, and patient data were obtained through a review of hospital information systems and archived medical records.

Within this framework, pediatric patients aged 0–18 years who were diagnosed with acute appendicitis and managed at the Department of Pediatric Surgery, Van Yüzyılı University Faculty of Medicine, between January 2015 and January 2025 were included in the

study. A total of 312 patients constituted the study population. Patients with incomplete medical records, uncertain diagnosis, or missing follow-up data were excluded from the study. Patients were categorized into two groups according to the treatment approach: conservative management (antibiotic therapy) and surgical management (open or laparoscopic appendectomy).

All patients were evaluated through a multidisciplinary approach involving pediatricians, pediatric surgeons, and radiologists. Demographic data (age, sex), clinical findings (duration of symptoms, fever, abdominal tenderness, rebound tenderness), laboratory parameters (leukocyte count and C-reactive protein), imaging findings, treatment modality, complications, and length of hospital stay were retrospectively recorded.

The decision between conservative and surgical management was made based on the patient's clinical presentation, laboratory findings, and radiological evaluation. Conservative treatment was primarily considered for patients with uncomplicated appendicitis who had stable clinical findings, no evidence of perforation, abscess formation, diffuse peritonitis, or generalized abdominal tenderness on clinical and radiological assessment. Patients presenting with suspected complicated appendicitis, progressive symptoms, generalized peritonitis, radiological evidence of perforation or abscess formation, or clinical deterioration during follow-up were managed surgically.

All treatment decisions were made following multidisciplinary evaluation and discussion among pediatric surgeons, pediatricians, and radiologists, taking into consideration both clinical findings and imaging results.

Among surgically treated patients, the choice between laparoscopic and open appendectomy was determined according to surgeon preference, disease severity, imaging findings, intraoperative considerations, and technical availability. Laparoscopic appendectomy was generally preferred in clinically stable patients, whereas open appendectomy was performed in selected patients with advanced inflammatory findings, suspected perforation, extensive intra-abdominal contamination, or when laparoscopic surgery was considered less appropriate by the operating surgeon.

This study aimed to compare the clinical outcomes of conservative and surgical treatment approaches in pediatric acute appendicitis within a multidisciplinary management framework based on real-world clinical data. In addition, factors associated with treatment selection and treatment outcomes were evaluated.

2.1.Statistical Analysis

Statistical analyses were performed using IBM SPSS Statistics for Windows (IBM Corp., Armonk, NY, USA), version 27.0. Continuous variables were assessed for normality using the Kolmogorov–Smirnov test, Shapiro–Wilk test, and visual inspection of histograms and Q–Q plots. Normally distributed variables were presented as mean ± standard deviation (SD), whereas non-normally distributed variables were expressed as median and interquartile range (IQR). Categorical variables were presented as frequencies (n) and percentages (%).

Comparisons between the conservative and surgical treatment groups were performed using the Student's t-test for normally distributed continuous variables and the Mann–Whitney U test for non-normally distributed variables. Categorical variables were compared using the Pearson chi-square test or Fisher's exact test when appropriate.

Variables associated with complicated appendicitis in univariate analyses were entered into a multivariate logistic regression model to identify independent predictors. Results were reported as odds ratios (ORs) with 95% confidence intervals (CIs).

Receiver operating characteristic (ROC) curve analysis was performed to evaluate the diagnostic performance of selected clinical and laboratory parameters in predicting

complicated appendicitis. Optimal cutoff values were determined using the Youden index.

All statistical tests were two-tailed, and a p-value <0.05 was considered statistically significant.

3. Results

A total of 312 pediatric patients were included in the study, of whom 59.3% (n=185) were male and 40.7% (n=127) were female. The median age was 11 years (IQR: 8–15). Among all patients, 71.8% (n=224) underwent surgical treatment, while 28.2% (n=88) were managed conservatively. There were no statistically significant differences between the groups in terms of age and sex distribution (p>0.05).

The duration of symptoms was significantly shorter in the conservative group compared with the surgical group [median 18 hours (IQR: 12–24) vs. 30 hours (IQR: 20–48); p<0.001]. Clinical findings such as rebound tenderness (62.5% vs. 18.2%) and fever (41.5% vs. 19.3%) were significantly more frequent in the surgical group (both p<0.001). Laboratory analysis revealed significantly higher leukocyte and CRP levels in the surgical group (p<0.001). These findings indicate that patients managed surgically generally presented with more advanced clinical and inflammatory features at admission. These demographics, clinical, and laboratory characteristics are summarized in Table 1.

Table 1. Demographic, clinical, and laboratory characteristics of patients

Variable	Surgical (n=224)	Conservative (n=88)	p-value
Age (years, median IQR)	11 (8–15)	10 (7–14)	0.18
Male sex (%)	60.3	56.8	0.57
Symptom duration (hours)	30 (20–48)	18 (12–24)	<0.001
Fever (%)	41.5	19.3	<0.001
Rebound tenderness (%)	62.5	18.2	<0.001
Leukocyte (×10³/μL)	15.2 ± 4.3	11.8 ± 3.1	<0.001
CRP (mg/L)	68 (35–110)	22 (10–45)	<0.001

Data are presented as median (interquartile range, IQR), mean ± standard deviation (SD), or percentage (%), as appropriate. Continuous variables were compared using Student's t-test or Mann–Whitney U test, depending on normal distribution. Categorical variables were analyzed using the Pearson chi-square test. CRP: C-reactive protein.

In the surgical group, laparoscopic appendectomy was performed in 64.7% (n=145) of patients, while 35.3% (n=79) underwent open appendectomy. Histopathological evaluation demonstrated complicated appendicitis (perforation, gangrene, or abscess) in 68.8% (n=154) of surgically treated patients.

Table 2. Comparison of clinical outcomes

Variable	Surgical (n=224)	Conservative (n=88)	p-value
Complication rate (%)	21.4	9.1	0.01
Length of hospital stay (days)	4 (3–6)	2 (2–3)	<0.001
Treatment failure (%)	—	15.9	—
Complicated appendicitis (%)	68.8	—	—

Continuous variables are expressed as median (IQR) and were compared using the Mann–Whitney U test. Categorical variables are presented as percentages and were analyzed using the Pearson chi-square or Fisher's exact test where appropriate. Treatment failure was defined as the need for surgical intervention following initial conservative management. Complicated appendicitis includes perforated, gangrenous appendicitis or intra-abdominal abscess.

In the conservative group, the initial treatment success rate was 84.1% (n=74), whereas 15.9% (n=14) required subsequent surgical intervention due to treatment failure. Patients who underwent successful conservative treatment generally demonstrated lower inflammatory marker levels and shorter symptom duration at presentation.

The overall complication rate was significantly higher in the surgical group compared with the conservative group (21.4% vs. 9.1%, p=0.01). The most common complications were surgical site infection and intra-abdominal abscess. The median length of hospital stay was also significantly longer in the surgical group [4 days (IQR: 3–6) vs. 2 days (IQR: 2–3); p<0.001]. The higher complication rate and prolonged hospitalization observed in the surgical group were likely associated with the greater proportion of complicated appendicitis cases in this cohort. Clinical outcomes are detailed in Table 2.

Multivariate logistic regression analysis identified symptom duration >24 hours (OR: 2.87, 95% CI: 1.65–4.98, p<0.001), CRP level >50 mg/L (OR: 3.42, 95% CI: 1.89–6.21, p<0.001), and the presence of rebound tenderness (OR: 2.15, 95% CI: 1.22–3.79, p=0.007) as independent predictors of complicated appendicitis (Table 3). Among these variables, elevated CRP demonstrated the strongest association with complicated appendicitis in the multivariate model.

Table 3. Independent predictors of complicated appendicitis

Variable	OR	95% CI	p-value
Symptom duration >24 hours	2.87	1.65–4.98	<0.001
CRP >50 mg/L	3.42	1.89–6.21	<0.001
Rebound tenderness	2.15	1.22–3.79	0.007

Multivariate logistic regression analysis was performed to identify independent predictors of complicated appendicitis. Results are presented as odds ratios (OR) with 95% confidence intervals (CI). Variables with p<0.10 in univariate analysis were included in the multivariate model. A p-value <0.05 was considered statistically significant.

4. Discussion

This study evaluated conservative and surgical treatment approaches in pediatric acute appendicitis within a multidisciplinary management framework and demonstrated that both strategies can be effectively applied when guided by appropriate patient selection. Our findings further suggest that treatment selection in pediatric appendicitis should be individualized according to clinical severity, laboratory findings, and radiological assessment rather than relying solely on a uniform treatment approach. Clinical severity, duration of symptoms, and inflammatory markers emerged as key determinants influencing both treatment choice and clinical outcomes. These findings are consistent with current literature emphasizing the importance of individualized management strategies in pediatric appendicitis[1,3,4].

Appendectomy has long been regarded as the standard treatment for acute appendicitis, particularly in complicated cases where it provides definitive management[4,5]. In our cohort, the predominance of surgical treatment (71.8%) reflects ongoing clinical practice trends. The high rate of complicated appendicitis in the surgical group (68.8%) suggests that patients with more advanced disease were more likely to undergo operative management. This observation aligns with previous studies indicating that delayed presentation and increased inflammatory burden are strongly associated with complicated appendicitis[3,9]. This finding also supports the clinical decision-making process used in our cohort, where patients demonstrating more severe clinical and radiological findings were preferentially managed surgically.

Nonoperative management has gained increasing attention as an alternative in selected cases of uncomplicated appendicitis. In the present study, the success rate of conservative treatment was 84.1%, which is comparable to previously reported rates ranging between 70% and 90%[6–8]. Minneci et al. demonstrated that nonoperative management may yield outcomes similar to surgical treatment in selected patients[6], while Svensson et al. reported that antibiotic therapy could be safely applied in nonperforated cases[7]. Nevertheless, the observed treatment failure rate of 15.9% in our study is consistent with meta-analytic data by Georgiou et al., underscoring the necessity for careful patient selection and close follow-up in nonoperative strategies[8]. The favorable success rate observed in our study further supports the feasibility of conservative treatment in appropriately selected patients within a multidisciplinary clinical framework.

One of the most important findings of this study is the identification of symptom duration, CRP level, and rebound tenderness as independent predictors of complicated appendicitis. Prolonged symptom duration has been consistently associated with an increased risk of perforation in the literature[9,10]. Similarly, elevated CRP levels have been widely recognized as indicators of inflammatory severity and have been incorporated into various diagnostic algorithms[11]. These findings reinforce the importance of integrating clinical and laboratory parameters in decision-making processes. The identification of these predictors may also assist clinicians in determining the most appropriate treatment strategy and in recognizing patients who may require early surgical intervention.

Although higher complication rates and longer hospital stays were observed in the surgical group, this should be interpreted in the context of baseline disease severity. Patients in the surgical group had a higher proportion of complicated appendicitis, which likely contributed to worse outcomes. Previous studies have similarly emphasized that clinical outcomes are more closely related to disease severity at presentation rather than the treatment modality itself[3,12]. Therefore, direct comparison of postoperative outcomes between treatment groups should be interpreted cautiously, considering the substantial differences in disease severity at initial presentation.

The multidisciplinary approach applied in this study represents a key strength. Collaboration among pediatricians, pediatric surgeons, and radiologists likely improved diagnostic accuracy and facilitated appropriate treatment selection. Current guidelines also highlight the importance of such integrated approaches in optimizing patient outcomes and reducing unnecessary surgical interventions[4,13]. Furthermore, multidisciplinary assessment may contribute to more rational selection of patients for conservative treatment and may help avoid delayed surgical intervention in high-risk patients.

Recent literature has also explored the impact of obesity on pediatric appendicitis outcomes. Obesity has been associated with delayed diagnosis, more challenging physical examination, and increased complication rates[14]. Although obesity was not directly analyzed in our study, the association between prolonged symptom duration and complicated appendicitis may indirectly reflect similar mechanisms. Future studies incorporating anthropometric variables may provide further insights.

Advancements in minimally invasive surgery have also influenced the management of pediatric appendicitis. In our study, the majority of surgical procedures were performed laparoscopically, which is consistent with current trends favoring minimally invasive techniques due to their association with reduced postoperative pain, shorter recovery times, and improved cosmetic outcomes[15]. The high utilization rate of laparoscopic appendectomy in our cohort further reflects the increasing adoption of minimally invasive surgical techniques in contemporary pediatric surgical practice.

Despite its strengths, this study has several limitations. Its retrospective design introduces potential biases, including selection and information bias. The single-center nature of the study may limit the generalizability of the findings. Additionally, long-term out-

comes such as recurrence rates in the conservative group were not evaluated. However, the relatively large sample size and the reflection of real-world multidisciplinary clinical practice enhance the clinical relevance of the results.

In conclusion, both conservative and surgical approaches have a role in the management of pediatric acute appendicitis. Careful patient selection based on clinical, laboratory, and imaging findings, combined with a multidisciplinary approach, is essential to optimize outcomes.

4.1.Limitations

Several methodological limitations should be considered when interpreting the findings of this study. First, the retrospective and single-center design may limit the accuracy and completeness of the collected data, introducing a potential risk of information bias. In addition, since patients were not randomized according to treatment modality, baseline differences between groups are likely. This is particularly relevant given the higher proportion of complicated cases in the surgical group, which should be taken into account when comparing outcomes.

Furthermore, treatment allocation was based on multidisciplinary clinical decision-making rather than predefined randomization criteria. Although this approach reflects real-world clinical practice, it may have introduced selection bias into treatment assignment.

Second, long-term follow-up data for patients managed conservatively were limited; therefore, recurrence rates and long-term outcomes could not be comprehensively evaluated.

Third, certain potential confounding factors, such as obesity, socioeconomic status, and environmental influences affecting delay in presentation, were not included in the analysis. This may have limited the ability to fully assess factors influencing complications and treatment success.

Furthermore, although diagnostic and therapeutic decisions were made within a multidisciplinary framework, interobserver variability among clinicians could not be completely eliminated. Similarly, the choice between laparoscopic and open appendectomy was determined according to clinical judgment and surgeon preference, which may have contributed to treatment heterogeneity within the surgical group.

Finally, as the study population was derived from a specific geographic region, the generalizability of the findings to other populations and healthcare settings may be limited.

Despite these limitations, the relatively large sample size and the use of real-world clinical data represent important strengths of the study, contributing valuable insights into the management of pediatric acute appendicitis. In addition, the inclusion of both conservative and surgical treatment cohorts allowed evaluation of treatment outcomes within a multidisciplinary clinical practice setting.

5. Conclusion

This study demonstrates that both conservative and surgical treatment approaches can be safely and effectively applied in the management of pediatric acute appendicitis when guided by appropriate patient selection. Clinical severity, duration of symptoms, and inflammatory markers—particularly CRP levels and the presence of rebound tenderness—emerge as key factors in determining disease complexity and guiding treatment decisions.

In selected cases of uncomplicated appendicitis, conservative management represents an effective alternative in the short term and may reduce hospital stay. However, due to the risk of treatment failure, close clinical monitoring of these patients is essential.

In contrast, surgical treatment remains the most reliable and definitive option, particularly in cases of complicated appendicitis.

A multidisciplinary approach plays a critical role in ensuring accurate diagnosis and appropriate treatment selection, thereby contributing to improved clinical outcomes. The integration of clinical findings, laboratory parameters, and radiological assessment appears to be particularly valuable for identifying patients who are most likely to benefit from conservative management and those who require early surgical intervention.

Our findings support an individualized treatment strategy based on disease severity and patient characteristics rather than a single standardized approach for all patients.

Future prospective multicenter studies with long-term follow-up are needed to establish more standardized and evidence-based management algorithms for pediatric acute appendicitis.

genAI: No artificial intelligence-based tools or generative AI technologies were used in this study. The entire content of the manuscript was originally prepared, reviewed, and approved by all authors.

Statement of Ethics: Ethical approval was obtained from the Non-Interventional Clinical Research Ethics Committee of Van Yüzyılı University (Approval No: 2026/03-54, Date: 13/03/2026). The study was conducted in accordance with the principles of the Declaration of Helsinki.

Data Availability: The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

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Conflict of Interest: The authors declare that they have no conflict of interest related to this study.

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