

Chapter 7

The Role of Interval Appendectomy following Non-Operative Treatment for Acute Appendicitis in Children: A Review

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Abstract

Acute appendicitis is a prevalent surgical emergency in pediatric patients. Traditionally, appendectomy has been considered the standard treatment; however, there is growing evidence supporting non-operative management (NOM) for selected cases of uncomplicated appendicitis and as an initial approach for complicated appendicitis presenting with abscess or phlegmon. The role of interval appendectomy (IA), defined as the elective removal of the appendix weeks after successful NOM, remains a subject of debate. Historically, IA was routinely recommended to prevent recurrent appendicitis and to exclude underlying pathology. Recent evidence, however, challenges this practice by highlighting relatively low recurrence rates following successful NOM, advancements in imaging and follow-up protocols, and the morbidity and costs associated with additional surgery. This review evaluates the current evidence regarding IA in children following NOM for both complicated and uncomplicated acute appendicitis. The literature indicates that routine IA may not be necessary for all children after successful NOM. While certain subgroups, particularly those with appendicoliths, persistent symptoms, or recurrent disease, may benefit from interval appendectomy, a selective rather than routine approach appears increasingly justified. Shared decision-making involving children, parents, and clinicians is crucial when weighing the risks of recurrence against the morbidity and costs of surgery.

Keywords: Acute Appendicitis, Interval Appendectomy, Delayed Appendectomy, Complicated Appendicitis, Uncomplicated Appendicitis, Children, Non-Operative Treatment.

Introduction

Acute appendicitis represents the most prevalent general surgical emergency encountered in the pediatric demographic. It exhibits an annual incidence rate of 90 cases per 100,000 individuals in most Western nations, with the highest incidence observed in children aged 9 to 12 years, and it is marginally more prevalent in male children. Clinically, it presents as right lower abdominal pain, initially central and subsequently radiating to the right lower abdomen. Abdominal examination may reveal guarding and rigidity in the right iliac fossa (Podany, 2017). Diagnosing acute appendicitis in the pediatric population requires a clinical evaluation, supplemented by blood tests such as a full blood count to detect leukocytosis and inflammatory markers, including C-reactive protein (CRP), along with urine analysis. Imaging techniques, including ultrasound and computed tomography, are employed when complications such as perforation, abscess formation, or appendicular phlegmon are suspected (Morrow & Newman, 2007).

The management of acute appendicitis in pediatric patients encompasses both non-operative treatment with antibiotics and appendectomy, which can be executed via open or laparoscopic methods (Rentea & St. Peter, 2017b). Typically, non-operative management of acute, uncomplicated appendicitis does not necessitate an interval appendectomy. However, patients receiving non-operative treatment for complicated appendicitis may require an interval appendectomy. The timing of this procedure remains contentious, with the prevalent recommendation being 8 to 12 weeks post-completion of non-operative treatment (Rentea & St. Peter, 2017a). According to the 2020 guidelines by the World Society of Emergency Surgeons (WSES) for managing acute appendicitis, routine interval appendectomy following non-operative treatment in children is not advised, except in cases of symptomatic recurrence (Di Saverio et al., 2020). Conversely, the Society of Gastrointestinal and Endoscopic Surgeons (SAGES), in their 2024 guidelines, conditionally recommends interval appendectomy

for pediatric patients post non-operative treatment, contingent upon the evidence available (Kumar et al., 2024). The 2025 Swedish National Guidelines for diagnosing and managing acute appendicitis in both adults and children advise against routine interval appendectomy following non-operative treatment for acute appendicitis (Salö et al., 2025).

Given the uncertainty surrounding the indication for interval appendectomy following non-operative management of acute appendicitis, this review article aims to assess the role of interval appendectomy in pediatric patients after non-operative treatment of both uncomplicated and complicated acute appendicitis. A comprehensive literature review was conducted using PUBMED, the Cochrane Database of Clinical Reviews, Semantic Scholar, and Google Scholar, focusing on clinical trials, observational studies, systematic reviews, and meta-analyses published between 1990 and 2026. The search utilized the following keywords: “interval appendectomy,” “acute appendicitis,” “delayed appendectomy,” “complicated appendicitis,” “uncomplicated appendicitis,” “non-operative treatment,” and “children.” Articles not published in English, as well as case reports, commentaries, and letters to the editor, were excluded. This study exclusively included pediatric patients.

Discussion

Interval Appendectomy in children following non-operative treatment of complicated appendicitis

Interval appendectomy refers to the elective surgical removal of the appendix following non-operative management of complicated appendicitis. This procedure is typically conducted 8 to 12 weeks after the successful completion of non-operative treatment to prevent recurrent episodes of acute appendicitis (Fawcner-Corbett et al., 2014). Vane et al. evaluated the role of interval appendectomy in managing complicated appendicitis in pediatric patients. Their study included 86 children, with 59 undergoing immediate appendectomy and 27 undergoing interval appendectomies. The study found no significant differences in complications or length of hospital stay between the two procedures (Vane & Fernandez, 2006). Blakely et al. conducted a nonrandomized controlled trial to assess the effectiveness of early versus interval appendectomy in children with complicated appendicitis. The trial involved 131 children, divided into two groups: 64 underwent early appendectomy, while 67 underwent interval appendectomy. The results indicated that interval appendectomy was associated with lower rates of adverse events (30% compared to 55%) and a shorter duration away from normal activities (13.8 days compared to 19.4 days) (Blakely et al., 2011). Schmidt et al. conducted a retrospective assessment of hospital stay and complications associated with early and interval appendectomy in children with complicated appendicitis. Their study included 254 patients, with 232 undergoing early appendectomies and 22 undergoing interval appendectomies. The findings suggested that early appendectomy was linked to reduced hospital stays and fewer complications (Schmidt et al., 2026).

A retrospective study by Suzuki et al. examined the safety and feasibility of interval appendectomy following non-operative treatment for complicated appendicitis. This study included 42 patients, of whom 34 underwent interval appendectomy, and 8 underwent early appendectomy. The post-operative complication rate was lower in the interval appendectomy group (9% compared to 75%) (Suzuki et al., 2023). Similarly, Nazarey et al. conducted a retrospective study involving 105 patients with complicated appendicitis who received non-operative treatment followed by interval appendectomy. The intra-abdominal abscess rate was 27%, and the recurrence rate before interval appendectomy was 11% (Nazarey et al., 2014). Takahashi et al. investigated the experience of interval appendectomy following non-operative treatment in children with complicated appendicitis. This study included 43 patients, with 34 undergoing interval appendectomies. The interval appendectomy group experienced a longer hospital stay, and the recurrence rate was 15% (Takahashi et al., 2021). Zhang et al. conducted an intermediate-term evaluation of interval appendectomy in the pediatric population. Their study included 471 patients, with 377 undergoing emergency appendectomy and 96 receiving non-operative treatment followed by interval appendectomy. Patients who underwent interval appendectomy experienced reduced postoperative complications and adhesive intestinal obstruction (Zhang et al., 2021).

Hall et al. conducted a systematic review to evaluate the justification for performing an interval appendectomy after successful non-operative management of complicated appendicitis in children. This review included three studies encompassing 127 cases, revealing a complication incidence of 3.4% following interval appendectomy, a recurrence rate of 20.5% after non-operative treatment, and a hospital stay duration of three days for interval appendectomy (Hall et al., 2011). Additionally, Duggan et al. performed a systematic review and meta-analysis of randomized controlled trials comparing early versus interval appendectomy in children with complicated appendicitis. This analysis incorporated two studies with a total of 171 patients, demonstrating that emergency appendectomy was associated with a reduction in adverse events (OR 0.28, 95% CI, 0.1-0.77) and unplanned admissions (OR 0.08, 95% CI, 0.01-0.67) for cases with abscess formation. However, no significant differences were observed between emergency and interval appendectomy for complicated appendicitis without abscess formation (Duggan et al., 2016).

Hall et al. conducted an open-label, randomized controlled trial, known as the CHINA study, to compare active observation with interval appendectomy following successful non-operative treatment of complicated appendicitis in children. The study involved 106 patients, with 52 undergoing interval appendectomies and 54 receiving active observation. The recurrence rate for those under active observation was 12% (95% CI, 5-23), while the complication rate for interval appendectomy was 6% (95% CI, 1-17). The findings suggest that routine interval appendectomy may not be necessary (Hall et al., 2017). In a retrospective study by Puapong et al., the necessity of interval appendectomy in children post non-operative treatment was examined. Of the 72 patients treated non-operatively, 11 underwent interval appendectomy. Among the 61 patients who received only non-operative treatment, the recurrence rate was 11%. This study also indicated that routine interval appendectomy may not be required (Puapong et al., 2007). Similarly, a study by Karaca et al. on children with complicated appendicitis and localized abscess treated conservatively reported low recurrence rates, further supporting the notion that routine interval appendectomy is unnecessary (Rfan Karaca et al., 2001).

A systematic review by Sulkowski et al. examined interval appendectomy practices for complicated appendicitis in children, based on outcomes from the American Pediatric Surgical Association. This study incorporated 46 studies encompassing 6,222 patients. The recurrence rate ranged from 2% to 50%, and the optimal timing for interval appendectomy remained inconclusive. However, it was suggested that the procedure be performed within three months following the completion of non-operative treatment. The presence of appendicoliths was linked to an increased risk of recurrence, while the occurrence of appendicular neoplasms was rare (Sulkowski et al., 2026). Farr et al. investigated the optimal timing for interval appendectomy, including 500 patients in their study. The average interval for performing the appendectomy was 12.7 weeks. Procedures conducted for 12 weeks were associated with increased difficulty due to inflammation (Farr et al., 2021).

Otake et al. conducted a histological analysis of appendix specimens removed after interval appendectomy, following the completion of non-operative treatment for complicated appendicitis in children. The study included 48 children who underwent interval appendectomy, revealing that 24 of the 48 appendix specimens exhibited infiltration of inflammatory cells, foreign body reaction, and fibrosis (Otake et al., 2014). Similarly, Pederiva et al. examined the histopathology of the appendix in children who underwent interval appendectomy. In their study, 42 patients received non-operative treatment, and 33 underwent interval appendectomy. The analysis of the 33 appendix specimens indicated features of inflammation, with 53% showing infiltration into the serosa and 25% displaying signs of necrosis and hemorrhage. No malignant lesions were identified in the specimens (Pederiva et al., 2021). Fouad et al. also investigated the pathological findings following interval appendectomy in children. Their study included 149 patients, and all specimens demonstrated features of inflammation, with 17% containing appendicolith, and no evidence of malignancy was observed (Fouad et al., 2020).

Table 1

Study	Patients	Histological findings	Conclusion
Otake et al., 2014	Pediatric patients undergoing Interval Appendectomy after successful conservative management of appendiceal inflammatory mass/abscess	Histopathological changes were present in about half of the specimens, particularly fibrosis, foreign-body reaction, and persistent inflammatory cell infiltration. Foreign-body reaction was associated with retained appendicoliths.	Persistent chronic inflammatory changes suggest a continuing risk of recurrence and support consideration of Interval Appendectomy in selected children.
Fouad et al., 2020	149 children undergoing Interval Appendectomy after non-operative treatment of complicated appendicitis	All specimens (100%) demonstrated persistent inflammation on pathology. Appendicoliths were identified in 17% of specimens. No neoplasms were found.	Universal evidence ongoing inflammation after conservative treatment suggests that pathological resolution is often incomplete at the time of Interval Appendectomy.
Pederiva et al., 2021	32 interval appendectomy specimens were reviewed histologically	Inflammation was present in all specimens; 53% had mild-to-moderate inflammation (Grade 1–2) and 47% had moderate-to-severe inflammation (Grade 3–4). Necrosis with hemorrhage was present in 25%, and inflammatory infiltrate extended to the serosa in 53%. No carcinoid tumors or malignancies were detected.	Histological evidence of persistent inflammation remained even months after conservative treatment, despite many appendices appearing macroscopically normal at surgery.

Table showing a summary of the histological findings of the interval appendectomy specimen

Owen et al. conducted a laparoscopic interval appendectomy following non-operative management for complicated appendicitis in children. In this study, 35 children underwent the procedure after completing conservative treatment, with a median interval of 93 days. The mean duration of surgery was 55 minutes, and the hospital stay lasted one day, with no post-operative complications reported (Owen, 2006). Similarly, Esposito et al. performed a single-center retrospective study to evaluate the safety and effectiveness of laparoscopic interval appendectomy post non-operative treatment. This study included 71 patients, with a mean operative time of 27 minutes and a hospital stay of 32 hours, and also reported no procedural complications (Esposito, 2025).

Abiko et al. conducted elective laparoscopic interval appendectomies following non-operative management of acute appendicitis in pediatric patients. In total, 120 patients underwent interval laparoscopic appendectomy, with a mean interval of 48.5 days between initial treatment and surgery, and a mean operative duration of 38 minutes. Successful same-day discharge was achieved in 97.5% of cases, while complications occurred in 2.5% of cases (Ryoichi Abiko, 2026). Similarly, Whyte et al. performed a retrospective study on outpatient interval appendectomy following non-operative treatment for complicated appendicitis. This study included 24 patients, with 88% successfully discharged on the same day. The findings indicate that outpatient interval appendectomy is feasible in children (Whyte et al., 2008).

Interval Appendectomy following Non-Operative Treatment of Acute Uncomplicated Appendicitis in Children

Following the successful non-operative management (NOM) of acute uncomplicated appendicitis in children, routine interval appendectomy is generally not advised. Recent pediatric studies indicate that a significant number of children who are effectively treated with antibiotics do not experience recurrent appendicitis, rendering interval appendectomy unnecessary for many cases. Long-term follow-up research has demonstrated that, although recurrence is possible, most patients do not encounter further episodes, thus avoiding the risks, costs, and recovery period associated with surgical intervention. As a result, current practice increasingly supports a selective approach to interval appendectomy, emphasizing shared decision-making between clinicians and families (Lipsett et al., 2022).

The decision to undertake an interval appendectomy should be tailored to individual cases, considering factors linked to recurrence or treatment failure. The presence of an appendicolith is the most consistently reported risk factor, correlating with an increased likelihood of recurrent appendicitis and failure of Non-Operative Management. Other considerations include recurrent abdominal symptoms, radiological evidence of ongoing appendiceal pathology, challenges in accessing emergency medical care, and significant parental anxiety about recurrence. Nonetheless, interval appendectomy carries its own risks, such as surgical-site infection, intra-abdominal abscess formation, adhesive bowel obstruction, anesthetic-related adverse events, postoperative pain, and elevated healthcare costs. Given these surgical risks and the relatively low recurrence rate following successful Non-Operative Management, many authors suggest that routine interval appendectomy provides limited benefit for children with uncomplicated appendicitis and should be reserved for selected high-risk cases (Brucchi et al., 2025; Faria et al., 2026).

Table 2

Study	Study Type	Key Findings	Implications for Interval Appendectomy
Hall et al., 2011	Systematic review of pediatric appendiceal mass/abscess management	Reported relatively low recurrence rates following successful Non-Operative Management and questioned the necessity of routine Interval Appendectomy in all children.	Routine Interval Appendectomy may not be necessary for every child after successful Non-Operative Management; observation is a reasonable alternative in selected patients.
Blakely et al., 2014	Prospective randomized trial comparing early vs interval appendectomy in perforated appendicitis with abscess/phlegmon	Early appendectomy reduced time away from normal activities and adverse events compared with delayed surgery.	Supports early definitive surgery in selected complicated appendicitis cases and highlights limitations of a delayed Interval Appendectomy strategy.
Hall et al., 2017 (CHINA Study)	Multicenter randomized controlled trial comparing active observation versus interval appendectomy after successful non-operative treatment of appendix mass	Recurrence occurred in approximately 12% of children managed with observation. More than 75% of children avoided an operation altogether. Observation resulted in fewer hospital days and was more cost-effective.	Landmark evidence against routine Interval Appendectomy. Supports active observation as the preferred strategy after successful Non-Operative Management, reserving Interval Appendectomy for selected patients with recurrent symptoms or high-risk features.
Suzuki et al., 2023	Contemporary pediatric cohort evaluating outcomes after Non-Operative Management	Demonstrated high success rates of Non-Operative Management with acceptable recurrence rates; identified patient factors influencing recurrence risk.	Interval Appendectomy should be individualized, particularly for children with appendicoliths or recurrent symptoms.
Schmidt et al., 2026	Retrospective comparison of early versus interval appendectomy in children with complicated appendicitis	Early appendectomy was associated with shorter cumulative hospital stay, whereas Interval Appendectomy avoided operating in an acutely inflamed field but required a second hospitalization.	Interval Appendectomy remains useful in selected patients but may increase overall healthcare utilization; benefits must be balanced against recurrence risk and family preference.
Sulkowski et al., 2026	Evaluation of elective Interval Appendectomy following successful Non-Operative Management in pediatric uncomplicated appendicitis	Focused on recurrence prediction and family decision-making; emphasized that not all children benefit from elective appendectomy.	Supports a risk-stratified approach in which Interval Appendectomy is reserved for patients at increased risk of recurrence or with significant family anxiety regarding future attacks

Table showing the role of interval appendectomy following non-operative treatment of acute appendicitis in children

Conclusion

The necessity of interval appendectomy following successful non-operative management of acute appendicitis in children remains a subject of debate. Although historically regarded as standard practice, routine interval appendectomy has been questioned due to emerging evidence indicating low recurrence rates, minimal risk of appendiceal neoplasms, and the morbidity and costs associated with additional surgical intervention. Current literature indicates that the majority of children who are successfully treated with non-operative methods do not experience recurrence, suggesting that routine appendectomy may be unnecessary. However, specific subgroups, such as those with appendicoliths, persistent symptoms, recurrent disease, or certain radiological findings, may still benefit from elective surgery. Contemporary practice increasingly favors a selective, individualized approach over universal interval appendectomy. Shared decision-making, which incorporates clinical risk factors, family preferences, quality-of-life considerations, and local expertise, provides the most suitable framework for management. Further prospective multicenter studies are necessary to establish definitive recommendations and optimize patient selection.

Declaration

Conflict of Interest Disclosure: No potential conflict of interest was declared by the authors.

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