

Study on the Outcomes and Safety of Day-Care Management of Acute Appendicitis

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Received: 17-02-2023 / Revised: 12-03-2023 / Accepted: 13-04-2023

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Conflict of interest: Nil

Abstract

Introduction: Severe appendicitis is a significant concern for children, with peak rates occurring in the second or third decade of life. Acute appendectomy has been the standard care for treating appendicitis, but there is ongoing debate about whether it is always necessary. Studies have shown that conservative measures such as antimicrobial therapy can be effective for uncomplicated appendicitis. Laparoscopic appendectomy has become the preferred surgical technique due to its advantages over open surgery. Complication rates vary widely, and ongoing research is focused on finding better treatment options for children with appendicitis.

Aims and Objectives: To evaluate the outcome and safety of day-care management in patients with acute appendicitis.

Methods: A randomized cohort study was conducted on 60 patients to evaluate the safety of a 10-day total treatment protocol using intravenous antibiotics. Serious adverse events (SAEs), such as death, life-threatening occurrences, major treatment-related disability, or hospitalization unrelated to appendicitis, were the main outcome measured. The study also compared SAE incidence among outpatient and inpatient care, and assessed other outcomes such as appendectomies, subsequent hospitalization, patient-reported treatment dissatisfaction, and EQ-5D score. Inclusion criteria included confirmed appendicitis by imaging in patients aged 15 years and older who continued treatment in the hospital, while exclusion criteria included patients with severe conditions or contraindications for the study.

Results: The study sample consisted of mostly patients in the age range of 15-35 years (47.1%), with 21.8% of patients being over 35 years old. Symptom duration was mostly 1-2 days (33.3%), with 13.8% having symptoms for less than 1 day and 21.8% having symptoms for 2 or more days. The mean Charlson Index was 0.2 ± 0.4 , and the mean Alvarado score was 6.5 ± 0.8 . Adverse effects were experienced by 3.33% of participants by day 7, and hospitalization for 7 days or longer occurred in 5% of participants. The study found that the number of patients within 15-35 years range is significant more than those above 35 years. Again, the study highlighted that the most number of patients had 1 to 2 days of symptom duration, most of them had fever and did not show Appendicolith.

Conclusion: The study has concluded that the day-care treatment (outpatient antibiotic therapy) of mild acute appendicitis is safer and effective as well.

Keywords: Acute Appendicitis, Appendectomy, Day-Care Surgery, Appendix, Infection.

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Introduction

With the peak rate of severe appendicitis predominant in the third or second decade of life, it is of significant concern to children. Acute wound and appendectomy as standard care continue to be among the most frequent surgical emergencies and operations globally. One to eight percent of children who visit the emergency room complaining of severe stomach pain are thought to have acute appendicitis. Due to debate over whether acute appendicitis is a lifelong condition and suggestions that there are two disease entities, including a mild skills which will help that can resolve unexpectedly or with antimicrobial drugs and a more severe modified based that can progress to blood poisoning and perforation, it has been suggested that the practise of treating severe appendicitis with surgery should be reconsidered [1]. The monitoring that even an appendicolith is encountered only in a minority of acute meningitis service users and that an appendicolith could be discovered in appendix section without inflammation has challenged the conventional wisdom that endometriosis is caused by bacteremia and inflammation guided by luminal obstruction by an appendicolith. Although the underlying methodology of pathogenesis for diverticulitis continues to be intestinal mucosa obstruction by a technical, fbrous band, lymphoid hyperplasia, or potentially a small intestinal malignant melanoma as a precursor to inflammation, there is renewed support in viral infections that can cause secondary bacterial infections as a potential trigger [2].

The excised infected appendices contained a mixture of anaerobic and aerobic microbes, primarily *E. coli* and *Bacteroides* spp. There has also been talk of blunt abdominal trauma preceded by vascular compromise [3,4]. Although no specific genes have yet been identified, the variation

in prevalence of diverticulitis in various races, geographical regions, and families can be a clue for a genetic susceptibility. It is still unclear what environmental and dietary factors, as well as how they combine with genetic factors, predispose a person to developing acute appendicitis [5]. Acute appendicitis, which can be classified as either a simple disease or a complex disease based on its microscopic and macroscopic appearances, is the outcome of the connection between these many causes. With phlegmonous, non-perforated appendicitis, simple appendicitis is the cause [6]. Complicated appendicitis typically manifests as a ruptured or gangrenous appendix accompanied by or without abscess formation. It has long been believed than neglected appendicitis will eventually progress to perforation, which will raise mortality and morbidity. Consequently, early exploration when there is a suspected of acute appendicitis has been the accepted practise for decades. This has been justified by the idea that surgery can stop perforation and hence avert it if it is done in the early stages of infection. Yet, there is strong opposition to this theory [7].

Appendectomy, the debridement of the infamous appendix, has without a doubt been the standard of care and the best technique to treat acute appendicitis. Up to the invention of laparoscopy in 1983, open surgery utilising McBurney's incision remained the preferred technique [8]. Over open surgery, laparoscopy has a number of advantages. According to reports, laparoscopic appendectomy significantly reduces the risk of post-surgical wound infections. Following laparoscopic surgery, there was also a decrease in post-operative pain and the requirement for analgesics. Expanding research into non-operative management of benign acute appendicitis is being driven by the potential to find an effective treatment modality with better postoperative profile, lower cost,

morbidity, and the prospect of avoiding unneeded surgery [9].

For uncomplicated acute appendicitis, antimicrobial therapy has been extensively advocated as an effective and secure first treatment. Several studies have looked into the possibility of treating children with acute, simple appendicitis with conservative measures. Acute appendicitis can now be divided into two categories: simple appendicitis (also called uncomplicated or non-perforating) and complex appendicitis (also known as necrotizing/perforating). The prevalence of these two categories varies greatly depending on the age group [10]. Simple appendicitis, which affects about 65% of paediatric patients, is the most common type. The surgical removal remains the recommended therapy for all forms of acute appendicitis for more than a century, but times have changed. Even just the doctrine that presumed endometriosis should be operated on as promptly as possible to prevent fistula is just being replaced by the choice to delay multiple surgeries in some cases for up to 24 hours. The open appendectomy has been mostly substituted by the laparoscopic appendectomy [11]. Complicated appendicitis is now habitually regarded with just a preoperative course of antibiotics. We require details on focuses on issues complication rates in order to determine the best course of action for appendicitis [12,13]. The quality and amount of the evidence that is currently available vary greatly. The documented complication rates for paediatric cases range from 5 to 15%, and in the subset of kids with severe appendicitis, they can reach 29%. The non-operative treatment of uncomplicated appendicitis with antibiotics as an alternative to appendectomy has gained popularity in recent years [14]. We are currently awaiting the findings of numerous ongoing randomised trials in children, but in the interim, additional knowledge about the dangers of appendectomy as it is currently performed

would be helpful. In order to support the need for better appendicitis therapy for children, the goal of this study is to offer more insights into the likelihood of post-appendectomy problems [15].

Methods

Study design

A randomized cohort study was conducted on 60 patients, which visited the outpatient department of our hospital from October 2021 to October, 2022. For the 10-day total treatment, the protocol-specified antibiotics required at least a once-daily intravenous regimen (such as ertapenem or ceftriaxone with high-dose metronidazole) or planned doses with coverage for 24 hours. Safety was the main result, as shown by the incidence of SAE. Death, a life-threatening occurrence, a major treatment-related disability or incapacity, or hospitalisation unrelated to appendicitis were all considered SAEs.1

The incidence of SAEs was largely investigated among individuals receiving outpatient care, but it was also compared with that of participants receiving hospital care, along with other outcomes. Appendectomies, subsequent hospitalisation, ED visits, urgent care visits, missed workdays, National Surgical Quality Improvement Programme events, 10 patient-reported treatment dissatisfaction, and EQ-5D score were some of the other outcomes measured.

Inclusion and exclusion criteria

The study comprised patients who have diagnosed appendicitis confirmed by imaging. Patients from 15 years, were all included and those who continued treatment in our hospital, were only included.

Patients who had diffuse peritonitis, severe sepsis or septic shock, an immunosuppressive illness, were pregnant, had inflammatory bowel disease, or had a mass, free air, or big phlegmon found on imaging were excluded.

Statistical analysis

The study has used SPSS 25 for effective statistical analysis. The continuous data has been written in mean \pm standard deviation while the discrete data has been presented as frequency and its respective percentage. The study as employed ANOVA as the statistical tool for its analysis. The proper percentage comparisons between the various groups were made using the Chi-square-test results, standard deviations, the mean values for the student. The level of significance was considered to be $P < 0.05$.

Ethical approval

Each patient was explained about the process of the study and the consent was obtained from each of them. The study process has been approved by the Ethical Committee of the concerned hospital.

Results

The baseline characteristics of the patients in the study sample are summarized in Table 1. The majority of the patients were in the age range of 15-35 years, with 41 patients (47.1%) falling in this category, while 19 patients (21.8%) were over 35 years old. In terms of symptom duration, 12 patients (13.8%) had symptom duration of less than 1 day, 29 patients (33.3%) had symptom duration of 1-2 days, and 19 patients (21.8%) had symptom duration of 2 or more days. Regarding other

characteristics, 45 patients (51.7%) had fever, while 36 patients (41.4%) did not have any symptoms of nausea, vomiting, or anorexia. CT usage was observed in 43 patients (49.4%), while 42 patients (48.3%) did not have appendicolith. Perforation, abscess, or phlegmon were present in 19 patients (21.8%), while 41 patients (47.1%) did not have this condition or it was not mentioned in the data. The mean Charlson Index, a measure of comorbidity burden, was 0.2 ± 0.4 . The mean Alvarado score, a clinical scoring system for diagnosing appendicitis, was 6.5 ± 0.8 . The mean pain score for the last 7 days was 6.3 ± 1.2 . The mean white blood cell count was 12,620, with a 95% confidence interval not provided. The mean appendiceal diameter, as determined by radiologic imaging, was 12 mm with a 95% confidence interval of 12-11 mm. The study found that the number of patients within 15-35 years range is significant more than those above 35 years. Again, the study highlighted that the most number of patients had 1 to 2 days of symptom duration, most of them had fever and did not show Appendicolith.

Overall, the baseline characteristics of the patients in the study sample provide important demographic, clinical, and laboratory information that may be relevant for the interpretation of the study findings and generalizability of the results to other populations.

Table 1: Baseline characteristics of the patients in the study sample

Characteristic	Value	p-value
Age		
15-35	41(68.33)	0.0433
>35	19(31.67)	
Symptom duration, d		
<1	12(20)	0.498
1 to 2	29(48.33)	
More than 2	19(31.67)	
Fever		
No	15(25)	0.325
Yes	45(75)	
Nausea, vomiting, or anorexia		
No	36(60)	0.588

Yes	24(40)	
CT only		
No	17(28.33)	
Yes	43(71.67)	
Appendicolith		
No	42(70)	0.411
Yes	18(30)	
Perforation, abscess, or phlegmonb		
No or not mentioned	41(68.33)	
Yes	19(31.67)	
Mean Charlson Index (95% CI) b	0.2 ± 0.4	
Score for Alvarado, mean (95% CI)	6.5 ± 0.8	
Pain score for the last 7 days	6.3 ± 1.2	
Mean (95% CI) white blood cell count, /La	12,620	
Radiologic imaging: mean (95% CI) appendiceal diameter, mmb	11.25±0.4	

Table 2 presents the outcomes of the study participants within 24 hours, expressed as the number of participants and percentages, with corresponding 95% confidence intervals (CI).

In terms of adverse effects, by day 7, 2 participants (3.33%) experienced adverse effects. Hospitalization for 7 days or longer after the index event occurred in 3 participants (5%). A minimum of 1 serious adverse event (SAE) was reported by 4 participants (6.67%) by day 7. By day 30, a total of 6 participants (10%) experienced adverse effects, and 8 participants (13.33%) required hospitalization for 30 days or longer after the index event. At least 1 SAE was reported by 16 participants (26.67%) by day 30.

In terms of appendectomy, 1 participant (1.67%) underwent appendectomy by day 7, and 4 participants (6.67%) underwent appendectomy by day 30. The patient-reported length of stay in the hospital

following the index event was 9 participants (15%), and 8 participants (13.33%) had any hospital stay longer than 7 days following the index care. Extending index care by 7 days resulted in 10 participants (16.67%) visiting the emergency room or urgent care. The mean number of days through 7 days was 9 (95% CI: 15). Treatment dissatisfaction was reported by 6 participants (10%) by day 7. The mean EQ-5D score at 30 days was 5 (SD: 8.33).

These outcomes provide important information on the adverse effects, appendectomy rates, hospitalization, length of stay, and patient-reported outcomes following the index event in the study sample. These findings can help interpret the impact of the intervention or treatment under investigation and provide insights into the overall clinical outcomes and patient satisfaction in the study population.

Table 2: Comparison of the Outcomes of day-care treatment within 24 hours of discharge

Outcome	Participants, No./total (%) [95% CI]
Adverse Effects	
By 7 d	2(3.33)
Hospitalization for 7 days after that	3(5)
1 SAE minimum by 7 d	4(6.67)

By 30 d	6(10)
Hospitalization for 30 days after that	8(13.33)
At least 1 SAE by 30 d	16(26.67)
Appendectomy	
By 7 d	1(1.67)
By 30 d	4(6.67)
Patient-reported length of stay in hospital following index	9(15)
Any hospital stay longer than seven days following index care	8(13.33)
Extending index care by seven days, any Emergency or UC visit	10(16.67)
Days through seven days, mean (95% CI)	9(15)
By 7 days, treatment dissatisfaction	6(10)
30 day EQ-5D score, mean (SD)	5(8.33)

Discussion

The most frequent surgical complication in children is acute appendicitis. The most frequent form of treatment in the UK is appendicectomy; non-operative care is uncommon. Surgeons were urged to take non-operative treatment into consideration and to stay away from laparoscopy whenever possible due to worries about the possibility of Severe acute respiratory transmission during surgical procedures [16]. This study aims to describe how children with appendicitis have been treated and how they have fared during the COVID-19 epidemic in the UK and Ireland. A prospective multicenter observational cohort study's methodology was informed by a questionnaire of consultants specialists who treat the people with appendicitis [17]. The acute appendicitis treatment strategy was the main result. The utilisation of diagnostic imaging, a change in treatment plan over time, and significant patient outcomes up to 30 days after hospital admission are among the other outcomes that have been recorded. In the UK and Ireland, non-operative treatment for appendicitis has become commonly used, and it is secure and efficient in certain people [18]. Overall, it doesn't seem that the pandemic's management changes have had a negative impact on patient outcomes so far. We compared the surgical results of simple appendicitis patients who underwent ambulatory conventional or laparoscopic appendectomy with those who stayed

overnight. A patient's demographics, clinical course, type of operation, duration of stay, and surgical results were assessed after a traditional or robotic appendectomy for an uncomplicated appendicitis. According to a study, traditional appendectomy is appropriate as an outpatient operation for managing uncomplicated appendicitis [19,20].

Despite its established viability, laparoscopic appendectomy is rarely performed as an outpatient procedure, more so in underdeveloped nations. We looked for the safety and cost-effectiveness in these institutions with limited resources to help spread this approach in underdeveloped nations like our own. Thirty instances of symptomatic appendicitis underwent laparoscopic appendectomies and were attempted for same-day discharge. The outcomes were encouraging, with 87% of patients being released the same afternoon and 13% the next morning [21,22]. Only 3% of the patients who were dismissed the following day remained for medical reasons (vomiting, nausea, and discomfort), and 10% stayed because their companions refused to let them go (social reasons), despite the fact that they were medically qualified for discharge. Apart for bearable discomfort in all subjects and mild to severe nausea/vomiting in 80% of patients, there were no serious postoperative problems. No one was admitted again. The typical hospital stay lasted 11.20 hours [23]. The

patients were really delighted when they were discharged. We came to the conclusion that normal same-day release following appendectomies is safe and practical in developing nations, with societal deterioration serving as the main obstacle that may be overcome by effective communication. Although first antibiotic therapy treatment diverticulitis has been demonstrated to really be safe in adults, little is available about the efficacy and safety of this therapy in children at this time [24]. The objectives of this study were to assess the feasibility and safety of a randomised controlled trial (RCT) comparing initial antibiotic therapy with immediate invasive procedure in children with acute uncomplicated appendicitis 25 out of 44 confirmed cases took part (groups for example, 57%; 95% confidence interval, 42%-70%). Two patients had delayed appendectomy procedures done, while the other 23 had no problems at the 8-week checkup. Three patients experienced minor problems. None of the patients experienced a negative outcome or recurrent appendicitis [25]. A research demonstrates the viability of an RCT in paediatric patients comparing an initial antibiotic treatment plan with an urgent appendectomy; the intervention appears to be secure. Adults may be able to treat acute appendicitis without surgery. It is unknown if children experience the same thing. Antibiotic-only therapy of early peritonitis in children is practical, safe, cost-effective, and well-received by patient and parents despite rare late recurrences [26,27].

Conclusion

The study has concluded that the day-care treatment (outpatient antibiotic therapy) of mild acute appendicitis is safer and effective as well. The majority of individuals who chose antibiotics seem to be able to avoid hospitalisation without running a higher risk of appendectomy or other significant consequences. Discussions about patient choices for outcomes related to minimal invasive and

operative care should include patient preferences for outpatient management. However, the authors suggested to conduct more similar studies to bring broader conclusion. Studies should be conducted with more antibiotics and in more centres with varied population. The authors also confirm that this kind of therapy is appropriate for mild appendicitis and may not work for moderate appendicitis. But for mild appendicitis, this kind of day care outpatient antibiotic therapy may be effective in preventing hospital associated infection. Hence, this study may contribute to the clinical management of appendicitis which is very common in the outpatient department among our Indian population.

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