

ORIGINAL RESEARCH

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Is an interval appendectomy still necessary in perforated appendicitis with inflammatory mass/abscess

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Abstract

We reviewed our experience in non-operative management without an interval appendectomy (IA), for patients who presented with perforated appendicitis with an abscess or inflammatory mass from November 2012 to November 2017 retrospectively. The data included age, sex, duration of symptoms, presence of appendicolith/abscess on CT imaging, WBC and CRP levels, antibiotic treatment, fever at presentation, percutaneous drainage procedure and complications, recurrent abscess, total length of hospitalization, follow-up period. A total of 32 patients were treated with nonoperative management during the study period. Nonoperative management without an IA was successful in 31 patients (96%). Study patients included were admitted to the surgical ward for observation. The mean age of the patients was 9.74 ± 3.55 years. 19 male and 13 female patients were included in the study. The mean duration of symptoms was 8.75 ± 4.69 days. The mean number of Ct scans was 1.21 ± 0.42 per patient. Percutaneous drainage was performed in 10 patients. The mean of WBC levels at presentation was 19030.00 ± 7192.24 cells/ μ L and CRP levels was 156.61 ± 94.23 mg/dl. Intravenous piperacillin-tazobactam (Tazosin®, Pfizer, New York, NY) were given 400 mg/kg/day in four divided doses. Diet were started to the patients who were afebrile and had diminished abdominal pain during observation. The mean length of hospitalization was 13.03 ± 5.82 days. The mean duration of follow-up period 34.65 ± 20.48 months. Nonoperative management without IA is a preferable choice for perforated appendicitis with abscess or mass.

Keywords: Perforated appendicitis, nonoperative treatment, percutaneous drainage, abscess, inflammatory mass, interval appendectomy

Introduction

Appendicitis is the most common reason for emergency surgery during childhood [1]. Currently, an emergency appendectomy is the preferred treatment option for the majority of children who present with acute appendicitis, although the operation is associated with technical difficulties in cases of perforated appendicitis that present at a later term with inflammatory masses or abscesses due to the disrupted anatomy and the need to dissect the mass in order to locate the appendix [2]. Nonoperative treatments that involve intravenous antibiotherapy and/or percutaneous drainage of the abscess are common treatment approaches in patients who present at this stage [3]. Following a successful nonoperative treatment, an interval appendectomy (IA) to prevent recurrence is a conventional surgical approach, which offers advantages regarding reducing the risk of complications and morbidity to which the patients are exposed during or after surgery [4]. However, whether there is a

need for this operation has the subject of much discussion recently due to the rate of IA-related morbidity and the risk of recurrence being low in different patient series [2,5].

The present study reported the long-term outcomes of nonoperative treatments without IA (intravenous antibiotics and/or percutaneous drainage) in patients with perforated appendicitis that present with an inflammatory mass or abscess.

Material and Method

The study sample included children aged 5–18 years who presented at the Marmara University School of Medicine Emergency Department with perforated appendicitis and with an abscess or inflammatory mass between November 2012 and November 2017. The data were analyzed retrospectively, and included age, sex, duration of symptoms, number of computerized tomography (CT) scans performed per patient, presence of appendicolith/abscess on CT imaging, percutaneous drainage procedure and complications, WBC, CRP levels and fever at presentation, antibiotic treatment, total length of hospitalization, duration of follow-up period, and presence of recurrent abscess/appendicitis. The patients' radiological images from the time of presentation were reviewed

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by the same pediatric radiologist. Percutaneous drainages of abscess were performed by an interventional radiologist in patients who were eligible for the procedure. A post-discharge follow-up of the patients was carried out monthly for the first three months, and once every three months for the following nine months through radiological and clinical evaluations. In the one-year follow-up, the patients were also contacted by telephone to obtain information on their status. Written informed consent was obtained from each patient, and this study was approved by the Ethics Committee (09.2017.662) and was conducted in accordance with the principles of the Declaration of Helsinki.

Statistical analysis

The statistical analysis was performed using Statistical Package for Social Sciences (SPSS) version 20.0 software (IBM Corp., Armonk, NY, USA). Descriptive statistics were expressed as mean±standard deviation (SD) for continuous variables, and in number and percentage for categorical variables.

Results

A total of 32 patients were treated with a nonoperative management approach during the study period. The patients included in this study were admitted to the surgical ward for observation, and patients who were afebrile and who had diminished abdominal pain during observation were started on a diet. The mean age of the patients was 9.74±3.55 years, and 19 male (59%) and 13 female (40%) patients were included in this study. The mean duration of symptoms was 8.75±4.69 days; the mean number of CT scans was 1.21±0.42 per patient; all of the patients presented with an abscess, and 11 of them had appendicolith. The percutaneous drainage of abscesses was performed by an interventional radiologist in 10 patients who were eligible for the procedure (Figure 1). There were no complications secondary to the procedure. The mean WBC level at the time of presentation was 19030.00±7192.24 cells/ μ L, and the mean CRP level was 156.61±94.23 mg/dl. Of the total, 20 patients had a fever at presentation. As an initial antibiotherapy, all patients were administered intravenous piperacillin-tazobactam (Tazosin®, Pfizer, New York, NY) 400 mg/kg/day in four separate doses. Of the total, two patients, who had persistent fever were switched to another antibiotherapy based on the growth culture results of the percutaneous aspiration samples. The mean length of hospitalization was 13.03±5.82 days, and the mean duration of the follow-up period was 34.65±20.48 months. No recurrent abscess/appendicitis was identified in 31 patients during the follow-up period, and only one patient was admitted to another clinic with abdominal pain and underwent an appendectomy. Nonoperative management without IA was successful in 31 patients (96.8%).

Discussion

Nonoperative treatment followed by IA for the management of perforated appendicitis presenting at a late-term with an inflammatory mass or an abscess was first defined 25 years ago [6]. While several pediatric surgeons still follow this approach, whether or not the need exists for IA has recently been a subject of discussion [2,5,7]. The present study investigated long-term outcomes in patients who received nonoperative treatment without IA (intravenous antibiotic and/or percutaneous drainage).

In their literature review, Hall et al. found out that the risk of recurrent

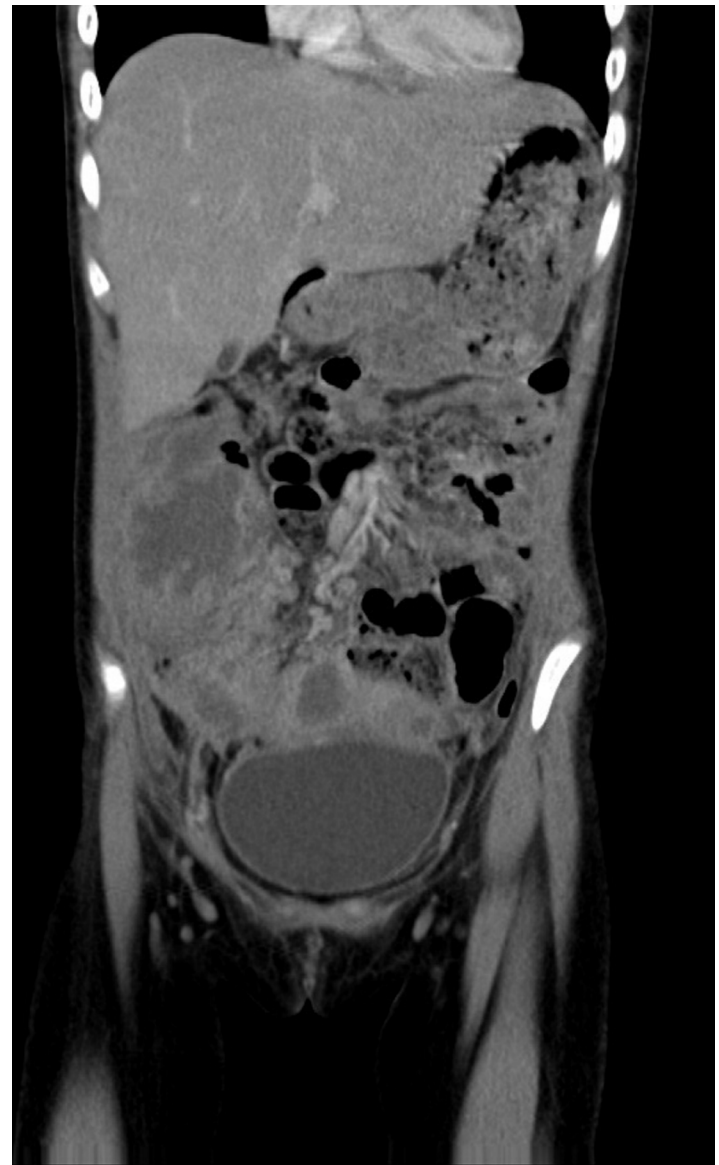


Figure 1. On coronal CT image; inflammatory mass is seen on right lower quadrant with abscess formation

appendicitis was 20% in patients who followed a nonoperative treatment approach. Indeed, this finding indicates that five children undergo an operation to protect one child from recurrence [2]. Studies that investigated the outcomes of nonoperative treatments aimed to identify the potential risk factors associated with recurrent appendicitis [3,5,8]. Ein et al. demonstrated that the presence of appendicolith significantly increased the risk of recurrence in patients who undergo nonoperative treatment [3] and argued that an interval appendectomy is necessary for the presence of appendicolith. In the present study, although 34.3% of the patients had appendicolith, only one (3%) patient experienced a recurrence, and the radiological images of that patient showed no appendicolith. In their study evaluating the risk of recurrent appendicitis after initial nonoperative treatment, Puapong et al. reported a recurrence rate of 8% and concluded that a routine IA was not necessary in all cases [5]. Puapong et al. also analyzed the risk factors associated with recurrence. While the female gender and the presence of an abscess at presentation appeared to be associated with recurrence, no statistically significant relation was established due to the limited number of recurrent cases [5].

Similarly, due to the very low number of recurrent cases in this study, we were unable to identify risk factors related to recurrence in our patient group.

In their study, Puapong et al. noted that 80% of all recurrences occurred within the first six months of the first episode [5]. In line with the literature, we believe that close monitoring of patients during the early-term, particularly for the first three months, is of vital importance for the early diagnosis of a recurrence. In addition, families should maintain an increased level of awareness of the symptoms of recurrence given that this will ensure a timely hospital admission and initiation of treatment. In another study, Tanaka et al. reported a recurrence rate of 34% after successful nonoperative treatment in their patients who declined the opportunity to undergo IA [7]. Moreover, they found out that almost 80% of the patients who did not develop a recurrence within the first three months also did not experience a recurrence over the following three years, and based on this finding, the authors concluded that IA may not be necessary at all [7]. In the present study, only one patient developed a recurrence within the first 3-month period, which indicates that our follow-up approach, which included radiological and clinical assessments performed monthly for the first three months, and once every three months thereafter for the following nine months, was adequate after successful nonoperative treatment.

Keckler et al. evaluated the time between nonoperative treatment and IA in a perforated appendicitis patient series presenting with well-defined abscesses [4]. Of their patients, 17.3% developed a recurrent abscess, and 11.5% had to undergo new drainage, while 10% of the patients developed a complication during the percutaneous aspiration/drainage procedure [4]. In the present study, the rate of recurrence was lower (3%) than has been previously reported in the literature, and none of the patients developed a complication during the drainage procedure. We believe that the low recurrence rate and the absence of complications in our patient group is a result of the effective intravenous large-spectrum antibiotherapy administered to all patients during the nonoperative treatment period, and the fact that the abscesses of patients that were already present at the time of the initial presentation were successfully drained through a percutaneous drainage procedure performed by the same experienced interventional radiologist. Moreover, our patients received a longer course of IV antibiotherapy given that the mean duration of their hospital stays was longer than previously reported in the literature [9] because there is no follow-up system for outpatient IV antibiotherapy administration in our country.

In their patient series, Keckler et al. performed a mean number of 3.5 ± 2.0 CT scans [4], and this high number represents a significant increase in the risk of cancer and a serious workforce loss in outpatients. The number of CT scans performed in the present study was found to be lower than in other studies in the literature (1.21 ± 0.42 per patient). Due to the increased risk of cancer associated with radiation exposure, the monitoring of recurrent abscess should be more vigilant in these patients, and we believe it would be appropriate to perform check-up CT scans only on patients presenting with clinical signs of recurrence.

There are a limited number of studies in the literature that compared appendectomies and nonoperative management (drainage/IA) at the time of admission in cases of perforated appendicitis presenting with inflammatory mass/abscess [10,11]. St. Peter et al. performed

a prospective randomized trial to compare appendectomies and nonoperative management (drainage/IA) at admission and investigated the high number of repetitive CT scans and the presence of recurrent abscess and drainage complications [9]. In that study, the duration of hospital stay, the risk of developing recurrent abscess and the total costs were not significantly different between the two groups. While the operation time appeared to be longer in patients who initially underwent surgery, the overall quality of life assessments was improved in this group [9]. To our knowledge, there is currently no prospective study in the literature that compared nonoperative management without IA approaches and initial appendectomies.

It should be noted that there are some limitations in this study, including its retrospective design and its small sample size. Following nonoperative treatment, our patients were followed-up for one year through radiological imaging and clinical assessments. Patients who were followed-up for more than one year were contacted by phone and questioned about their current status, potential episodes of abdominal pain, admissions to any other center with abdominal pains or any operations performed at other centers.

Conclusion

It would appear to be a preferable option to omit IA procedures after successful nonoperative treatment in cases with perforated appendicitis that present with inflammatory masses or abscesses. It should be kept in mind that the rate of recurrence was found out to be low in this study because the mean duration of hospital stay was long and the patients underwent appropriate antibiotherapy during that period, as well as percutaneous drainage performed by the same experienced radiologist. Still, it is important that these patients be carefully followed-up to check for recurrence, and that the families are warned and informed about the potential symptoms of recurrence.

Competing interests

The authors declare that they have no competing interest

Financial Disclosure

The financial support for this study was provided by the investigators themselves.

Ethical approval:

Written informed consent was obtained from each patient, and this study was approved by the Ethics Committee (09.2017.662) and was conducted in accordance with the principles of the Declaration of Helsinki.

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