Original Article

Study of Management of Appendicular Abscess in Children

Nandkishor Shinde, Ravindra Devani, Mohammed Abdul Baseer, Kiran Desai[1]

Department of Surgery, Pediatric Surgery Unit, Khaja Banda Nawaz Institute of Medical Sciences, [1]Department of Radiology, Khaja Banda Nawaz Institute of Medical Sciences, Gulbarga, Karnataka, India

Abstract

Aim: To compare the outcomes in children who underwent emergency surgery and those who underwent percutaneous drainage for appendicular abscess. **Materials and Methods:** In this prospective study, 45 children of appendicular abscess detected on ultrasonogram (USG) were included in the study. The following characteristics were registered: age, gender, the time from onset of symptoms to seeking care, pain, vomiting, fever and general peritonitis; white blood cell count. The size, location of the abscess was noted on USG. After the diagnosis, we divided the patients into two groups based on the type of management. Patients who underwent emergency surgery and appendectomy (Group 1) which composed of twenty patients (14 males and six females) with their ages ranged from 3 to 18 years, and patients treated with ultrasound-guided percutaneous drainage and interval appendectomy (Group 2) which composed of 25 patients, (15 males and ten females) with their ages ranged from 2 to 18 years. **Results:** Group 1 included twenty patients and Group 2 included 25 patients. In Group 1, on USG the average size of the abscess was 7.2 ± 2.5 cm. After the surgery regained their functional recovery during a mean period of 3.2 ± 1 days. In Group 2, on USG average abscess size was 6.8 ± 2.4 cm. After the procedure regained their functional recovery on the second day. No major complications were noted in Group 2. On the contrary, 12 patients (60%) of Group 1 show complications in the form of wound infection in eight children and wound dehiscence in four children. **Conclusions:** USG-guided percutaneous drainage was safe and effective way of management of appendicular abscess.

Keywords: Appendectomy, appendicular abscess, emergency surgery, percutaneous drainage

Introduction

Appendicitis is the most common disease requiring emergent abdominal surgery in children.[1] The lifetime risk of developing appendicitis is 8.7% for boys and 6.7% for girls.[2] Appendicular abscess is a life-threatening complication of acute appendicitis. It is observed in 2%–7% of the population presenting with appendicitis.[3,4]

The cause of acute appendicitis is unknown but is probably multifactorial; luminal obstruction, dietary and familial factors have all been suggested.[5]

Despite its high incidence, the diagnosis is often delayed in children.[1] Children often presenting with more diffuse symptoms compared to the adult population, making the disease more difficult to diagnose. The most common atypical features include the absence of fever; and as much as one-third of the paediatric patients have the absence of pain in the right lower quadrant. The diagnosis might also be delayed owing to the difficulty to carry out a proper examination of the paediatric patients and difficulties in communication.[6] A delayed diagnosis may lead to perforation and abscess formation.[1]

Prolonged symptoms of appendicitis (>72 h) with the delayed presentation are known risk factors for the development of complications such as rupture and abscess formation.[7,8]

The treatment of an appendicular abscess is still a debatable subject and studies have not agreed on what strategy to use. Some prefer immediate operation, whereas others advocate conservative management with or without interval appendectomy.[9,10]

Some authors advocated advanced immediate appendectomy in cases of complicated appendicitis,[11] although this approach

Received: 08-03-2018 **Revised:** 30-04-2019 **Accepted:** 18-04-2020 **Available Online:** 19-12-2020

Access this article online

Quick Response Code:

Website: www.afrjpaedsurg.org

DOI: 10.4103/ajps.AJPS_18_18

Address for correspondence: Dr. Nandkishore Shinde, C-F1, Asian Gardinia, Behind KBNIMS, Gulbarga - 585 104, Karnataka, India.
E-mail: drnandkishorshinde@gmail.com

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: WKHLRPMedknow_reprints@wolterskluwer.com

How to cite this article: Shinde N, Devani R, Baseer MA, Desai K. Study of management of appendicular abscess in children. Afr J Paediatr Surg 2020;17:64-7.

can certainly be technically challenging in the presence of a large periappendiceal inflammatory mass or abscess cavity. Others have advocated delayed appendectomy in selected populations.[12,13] Percutaneous drainage with the use of antibiotics is more efficient than treatment with antibiotics alone to successfully and completely treat appendicular abscess without an interval appendectomy.[14,15]

We conducted this study to compare the outcomes, morbidity and hospital stay in patients who underwent emergency surgery and those who underwent percutaneous drainage followed by interval appendectomy for treatment of appendicular abscess at our centre.

Materials and Methods

This prospective study was carried out from February 2016 to January 2018. All paediatric patients (<18 years of age) of appendicular abscess detected on Ultrasonogram (USG) were included in the study. The following characteristics were registered: age, gender, the time from onset of symptoms to seeking care, pain, vomiting, fever and general peritonitis; white blood cell count (WBC). Ultrasound examination was mandatory to diagnose appendicular abscess in all of our patients. The size and location of the appendicular abscess were noted on USG.

After the diagnosis, we divided the patients into two groups based on the type of management. The initial decision to operate or perform percutaneous drainage was taken randomly. Randomisation was done in all cases unless the parents insisted on a particular method.

Patients who underwent emergency surgery and appendectomy (Group 1) which composed of twenty patients (14 males and six females) with their ages ranged from 3 to 18 years, and patients treated with ultrasound-guided percutaneous drainage and interval appendectomy (Group 2) which composed of 25 patients (15 males and ten females) with their ages ranged from 2 to 18 years.

After the diagnosis, all patients were given intravenous (IV) antibiotics preferably ceftriaxone, amikacin, metronidazole combination and analgesic during the period of hospital stay till the result of culture and sensitivity was obtained, then antibiotics were continued accordingly. On discharge, we shift to oral antibiotics for 2 weeks. Hospital stay and complications were noted in each group.

Method of emergency surgery and appendectomy for Group 1

All patients of this group underwent emergency surgery. Intraoperatively appendectomy, evacuation of all gross pus and exudates, and thorough lavage with warm saline was done. A tube drain was fixed into the appendectomy site through a separate incision, anchored with a stitch, and connected to a sterile bag. The main incision wound was closed in layers with interrupted stitches. The wounds were inspected and their status was noted with daily dressing. The drains were removed after stoppage of pus discharge and USG revealed no residual collection. All patients were discharged when fever subsided, WBC normalised and oral feeding started.

Method of ultrasonogram-guided percutaneous drainage procedure and interval appendectomy for Group 2

All patients of this group were treated in the radiology department. All procedures were performed under local anaesthesia (0.5% lignocaine) and sedation with midazolam. We used the Seldinger technique for abscess drainage. A puncture needle 18G was introduced under USG guidance into the abscess cavity [Figure 1], followed by aspiration of 10 cc of abscess contents for culture and sensitivity study. A J-shaped guidewire was introduced and the needle was then removed. After sequential dilatation to 7 French using Teflon dilators, a pigtail drainage catheter 8 French was introduced over the wire. The content of the abscess was evacuated then the catheter was fixed to the skin using a silk suture, and was connected to the sterile bag. The catheter was left in place. We removed the catheter when the clinical manifestations subsided, the bag stopped drainage of pus or drained <5 cc serous fluid, and ultrasound examinations showed no residual fluid in the abscess cavity. After removal of the catheter, patients were discharged on the same day and interval appendectomy was done after 8 weeks in all the cases as a routine protocol in the institute.

The follow-up observation period was from the day of the first visit to the most recent visit to our outpatient clinic.

Statistical analysis was performed using SPSS, version 18.0 software. We summarised continuous data as mean (±), median; standard and categorical data as proportions.

Results

This study included 45 patients. The mean age of the patients was 8.3 years. The emergency surgery and appendectomy group (Group 1) included twenty patients and the USG-guided percutaneous drainage group (Group 2) included 25 patients.



Figure 1: USG showing Appendicular abcess

In Group 1, the average body temperature at admission was 38.1 ± 0.38, the mean leucocyte count was 16.7 ± 4.6 × 10^3. On ultrasonography, an abscess in the periappendix was noted in all children and the average size of the abscess was 7.2 ± 2.5 cm. After the surgery regained their functional recovery during a mean period of 3.2 ± 1 days in the form of starting oral intake and practice normal habits.

In Group 2, the average body temperature at admission was 37.3 ± 0.46, the average leucocyte count was 15.6 ± 5 × 10^3. On ultrasonography, an abscess in the periappendix was noted in all children and the average abscess size was 6.8 ± 2.4 cm. After the procedure regained their functional recovery on the 2nd day.

A comparison of various parameters between the emergency surgery group (Group 1) and the USG-guided percutaneous drainage group (Group 2) were as shown in Table 1.

No major complications were noted in Group 2; only abdominal discomfort and pain at site of catheter insertion were noted and managed with analgesic. On the contrary, 12 patients (60%) of Group 1 had complications in the form of wound infection in eight children and wound dehiscence in four children.

All children of Group 2 underwent open appendectomy within 2–3 months after the removal of the drainage catheter. None of the children of Group 2 had recurrent appendicitis during follow-up before interval appendectomy.

Fourteen children of Group 1 had appendicular perforation with gangrenous changes, four children had burst appendix, two children had inflamed appendix with pus, but in all children of Group 1, we were able to perform appendectomy in the same settings.

Discussion

Morbidity and mortality in acute appendicitis are related almost entirely to appendiceal perforation. The prevalence of appendiceal perforation in various paediatric series has ranged from 23% to 73%.[16] The perforation rate is even higher in younger children, with rates of 62%–88%, being reported in preschool children.[16] Up to one-half of patients with perforated appendicitis may experience a complication.[16]

An appendicular abscess is a collection of pus resulting from perforation or rupture of acutely inflamed appendix. The pus remains localised close to the appendix because it is walled off by adhesions formed by the surrounding abdominal structures. This prevents the pus from leaking and the infection spreading throughout the peritoneal cavity.[17]

No universal treatment standard exists when acute appendicitis is complicated by perforation and abscess formation. With the advent of image-guided percutaneous drainage of abscesses, the preferred initial management of these patients has now widely become nonoperative, consisting of percutaneous drainage and broad-spectrum IV antibiotics. This initial conservative approach is usually followed by interval appendectomy.[18-20] Jamieson *et al*. reported a successful treatment rate of 91% for appendiceal abscesses treated with drainage and IV antibiotics.[18] When drainage of an abscess was indicated, a safe percutaneous route or an experienced radiologist may not always be available. The procedure is associated with the risk of injury to the bowel or other organs, as had been noted in 4 of 52 cases in a reported series.[7]

Our results showed that percutaneous drainage was effective and safe in the treatment of patients with appendicular abscess. There were early functional recovery and hospital stay was less compared to emergency surgery and appendectomy group. There were no procedure-related complications occurred. All patients underwent interval appendectomy within 2–3 months after removal of the drainage catheter.

Our data compare favourably with the results of previously published studies[8,15] and confirm the effectiveness of percutaneous drainage in combination with broad-spectrum antibiotics in the treatment of patients with acute appendicitis complicated by perforation and abscess.[8,15]

A concern with early appendectomy is the difficulty of performing it during the acute phase immediately after the diagnosis of appendicular abscess. If surgery is performed

Table 1: Comparison between the emergency surgery group (Group 1) and the USG-guided percutaneous drainage group (Group 2)

Clinical character	Emergency surgery Group 1 (*n*=20), *n* (%)	US guided drainage Group 2 (*n*=25), *n* (%)
Median age (years)	8	9
Mean duration of symptoms before the presentation (days)	6.8±5.5	9.7±6.9
Right abdominal pain	20 (100)	25 (100)
Vomiting	15 (75)	20 (80)
Fever	12 (60)	16 (64)
Right iliac tenderness	20 (100)	25 (100)
Leucocytosis	18 (90)	22 (88)
Tachycardia	14 (70)	20 (80)
Mean hospital stay (days)	8.7±3.5	5±2
Complications	12 (60)	0

USG: Ultrasonogram

under the condition that inflammation due to appendicitis has spread to adjacent areas, the inflammation may have spread over a wide area. In addition, because of edema and the vulnerability of the adjacent small intestine and large intestine, secondary fistulas may develop. The incidence of complications was reported to be up to 26%.[21,22] In our study, safe appendectomy was performed in all twenty cases, intraoperative complications were uncommon, and postoperative complications included eight cases with wound infection and four cases with wound dehiscence that were managed conservatively.

The reported advantages of performing emergency surgery are that frequent follow-ups and tests are not required in comparison with conservative management and that re-hospitalisation after a certain time for the planned surgery is not required.[23]

One pilot randomised trial restricted to patients with well-formed intraabdominal abscesses ($n = 40$) found no major differences in outcomes when comparing early appendectomy versus interventional radiology drainage of the abscess with interval appendectomy.[24]

A limitation of this trial is the single-centre study, which may affect the generalisation of our findings. Other centres use different antibiotic regimens in their treatment plans, as well as various criteria for discontinuing antibiotics, and these may compare differently with early appendectomy.

Conclusions

USG-guided percutaneous drainage was safe and effective way of management of appendicular abscess because of early functional recovery, low incidence of complications, and shorter hospital stay but frequent follow-ups and re-hospitalisation after 8 weeks for interval appendectomy required.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Sivit CJ, Siegel MJ, Applegate KE, Newman KD. When appendicitis is suspected in children. Radiographics 2001;21:247-62.
2. Addiss DG, Shaffer N, Fowler BS, Tauxe RV. The epidemiology of appendicitis and appendectomy in the United States. Am J Epidemiol 1990;132:910-25.
3. Bradley EL 3rd, Isaacs J. Appendiceal abscess revisited. Arch Surg 1978;113:130-2.
4. Arnbjörnsson E. Management of appendiceal abscess. Curr Surg 1984;41:4-9.
5. Larner AJ. The aetiology of appendicitis. Br J Hosp Med 1988;39:540-2.
6. Becker T, Kharbanda A, Bachur R. Atypical clinical features of pediatric appendicitis. Acad Emerg Med 2007;14:124-9.
7. Keckler SJ, Tsao K, Sharp SW, Ostlie DJ, Holcomb GW 3rd, St Peter SD. Resource utilization and outcomes from percutaneous drainage and interval appendectomy for perforated appendicitis with abscess. J Pediatr Surg 2008;43:977-80.
8. Lasson A, Lundagårds J, Lorén I, Nilsson PE. Appendiceal abscesses: Primary percutaneous drainage and selective interval appendicectomy. Eur J Surg 2002;168:264-9.
9. Wersäll J, Stenström P, Arnbjörnsson E, Salö M. Evaluation of different treatments for appendiceal abscess in children. MOJ Surgery 2015;2:9.
10. Simillis C, Symeonides P, Shorthouse AJ, Tekkis PP. A meta-analysis comparing conservative treatment versus acute appendectomy for complicated appendicitis (abscess or phlegmon). Surgery 2010;147:818-29.
11. Goh BK, Chui CH, Yap TL, Low Y, Lama TK, Alkouder G, *et al*. Is early laparoscopic appendectomy feasible in children with acute appendicitis presenting with an appendiceal mass? A prospective study. J Pediatr Surg 2005;40:1134-7.
12. Weber TR, Keller MA, Bower RJ, Spinner G, Vierling K. Is delayed operative treatment worth the trouble with perforated appendicitis is children? Am J Surg 2003;186:685-8.
13. Gibeily GJ, Ross MN, Manning DB, Wherry DC, Kao TC. Late-presenting appendicitis: A laparoscopic approach to a complicated problem. Surg Endosc 2003;17:725-9.
14. Zerem E, Salkic N, Imamovic G, Terzić I. Comparison of therapeutic effectiveness of percutaneous drainage with antibiotics versus antibiotics alone in the treatment of periappendiceal abscess: Is appendectomy always necessary after perforation of appendix? Surg Endosc 2007;21:461-6.
15. Roach JP, Partrick DA, Bruny JL, Allshouse MJ, Karrer FM, Ziegler MM. Complicated appendicitis in children: A clear role for drainage and delayed appendectomy. Am J Surg 2007;194:769-72.
16. Pieper R, Kager L, Nasman P. Acute appendicitis: A clinical study of 1,018 cases of emergency appendectomy. Acta Chir Scand 1982;148:51-62.
17. Ahmed I, Deakin D, Parsons SL. Appendix mass: Do we know how to treat it? Ann R Coll Surg Engl 2005;87:191-5.
18. Jamieson DH, Chait PG, Filler R. Interventional drainage of appendiceal abscesses in children. AJR Am J Roentgenol 1997;169:1619-22.
19. Owen A, Moore O, Marven S, Roberts J. Interval laparoscopic appendectomy in children. J Laparoendosc Adv Surg Tech A 2006;16:308-11.
20. Chen C, Botelho C, Cooper A, Hibberd P, Parsons SK. Current practice patterns in the treatment of perforated appendicitis in children. J Am Coll Surg 2003;196:212-21.
21. Tingstedt B, Bexe-Lindskog E, Ekelund M, Andersson R. Management of appendiceal masses. Eur J Surg 2002;168:579-82.
22. Erdoğan D, Karaman I, Narci A, Karaman A, Cavuşoğlu YH, Aslan MK, *et al*. Comparison of two methods for the management of appendicular mass in children. Pediatr Surg Int 2005;21:81-3.
23. Samuel M, Hosie G, Holmes K. Prospective evaluation of nonsurgical versus surgical management of appendiceal mass. J Pediatr Surg 2002;37:882-6.
24. St Peter SD, Aguayo P, Fraser JD, Keckler SJ, Sharp SW, Leys CM, *et al.* Initial laparoscopic appendectomy versus initial nonoperative management and interval appendectomy for perforated appendicitis with abscess: A prospective, randomized trial. J Pediatr Surg 2010;45:236-40.