Colonic diverticulitis in children: A retrospective study of 16 patients

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Colonic diverticulitis in children

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Abstract

Background: Pediatric colonic diverticulitis (CD) is a rare entity. This study aimed to investigate the clinical features of CD in children.

Methods: We performed a retrospective chart review of children aged ≤15 years who were diagnosed with CD in our institution from May 2006 to November 2016.

Results: Sixteen patients were diagnosed with CD. All CD cases were observed to be solitary cecal diverticulitis; 14 cases were detected using ultrasound (US) and the other two cases were diagnosed by computed tomography (CT). Five patients were male (31.3%), and the median age was 12 years (range, 8–15 years). Initial symptoms were fever (temperature >38ºC) in six (37.5%) patients, right lower quadrant abdominal pain in 16 (100%), anorexia in eight (50%), and nausea/vomiting in five (31.3%). A patient experienced persistent constipation; however, diarrhea was not observed as a clinical symptom in any patient. The median duration from symptom onset to admission was 1 day (range, 0–4 days), and the median length of hospital stay was 6 days (range, 4–10 days).

All CD cases were treated with intravenous antibiotics. The median follow-up period was 90 months (range, 37–163 months), and during this period, recurrence of CD was

observed in three (18.8%) patients. At recurrence, antibiotics were administered in all cases.

Conclusions: In this study, all cases of CD were solitary cecal diverticulitis, and US was useful for the diagnosis of cecal diverticulitis in children. Non-operative treatment should be recommended as an initial treatment for CD in children.

Keywords: abdominal pain, children, colonic diverticulitis, solitary cecal diverticulitis, ultrasound

Colonic diverticulitis (CD) is common in Western and industrialized countries, especially among elderly patients [1]. Numerous retrospective studies from North America, Europe, and eastern Asia have reported that acute diverticulitis and associated complications have become increasingly more prevalent in the new millennium [2], and this phenomenon might result from the fact that a Western diet and lifestyle have become a new-normal in the era of modernity and globalization [2].

On the contrary, CD is a rare disease in children under 15 years, and the number of reported cases is extremely low [5-11]. Thus, the exact clinical features and treatment outcomes of CD in children remain unclear.

This study aimed to evaluate the clinical features and treatment outcomes of CD in children.

Methods

Patients

A retrospective chart review of patients aged ≤15 years, who were diagnosed with CD at the Japanese Red Cross Society Himeji Hospital between May 2006 and November 2016 was performed. Data collected included patients' age, sex, time lapse between onset of symptom and admission, symptoms (fever, vomiting, diarrhea), blood test results (white blood cell [WBC] count, neutrophil count, C-reactive protein [CRP]

level), and imaging results (maximum diameter of the diverticula, presence of fecalith, and presence of ascites on ultrasonography [US] and/or computed tomography [CT]). The diagnosis of CD was established by expert sonographers based on US examination or the attending radiologist by the interpretation of CT scans. The definitive diagnosis of CD in US was established when all the following criteria were satisfied: outpouching structure on the colon wall, short-segmental bowel wall thickening, and localized increased echo brightness of surrounding fatty tissue. The treatment strategy was decided by a single board-certified pediatric surgeon (T.H.) upon clinical and radiological evaluations or repeated physical examinations.

The initial antibiotic regimen consisted of a second-generation cephalosporin, which was intravenously administered for 4–7 days or until the abdominal pain subsided.

Ethical approval

This study was approved by the Institutional Review Board of the Japanese Red Cross Society Himeji Hospital (registration no.: R21). All data were collected anonymously, and patient consent was not required.

Results

Between May 1, 2006, and November 31, 2016, there were 16 patients with CD. All CD cases were cecal diverticulitis and were detected by US, CT, and enhanced CT in 14, one, and one patients, respectively. In all cases, appendices were normal, with normal diameters, and no evidence of inflammation was demonstrated by US or CT. In all 14 patients, US showed a round or oval structure contiguous to the colonic or cecal wall (Fig. 1), representing a solitary diverticulum in each patient. Fecal culture and fecal occult blood tests were not performed in any patient. The median age was 12 years (range, 8–15), and five (31.3%) of the 16 patients were male. Initial symptoms were fever (body temperature >38ºC) in six patients (37.5%), right lower quadrant abdominal pain in 16 (100%), anorexia in eight (50%), and vomiting in five (31.3%). A patient experienced persistent constipation; however, no patient developed diarrhea as a symptom. The median duration from onset of symptoms to admission was one day (range, 0–4 days). All CD cases were treated by non-operative therapy with intravenous antibiotics. The median follow-up period was 90 months (range: 37–163 months), and during this period, recurrence of CD was observed in three (18.8%) patients. Treatment at recurrence was intravenous antibiotics in all cases. The median length of hospital stay was 6 days (range: 4–10 days), and the median follow-up period was 90 months (range:

37–163). Patients' demographic information, findings of imaging studies, and antibiotics used are summarized in Table 1.

Discussion

This case series illustrates the clinical features and treatment outcomes of CD in children; all patients had solitary cecal diverticula, which were true diverticula. To the best of our knowledge, this is the largest case series of CD in children.

Right-sided CDs, including cecal diverticula, are generally limited in number, frequently solitary, and more common among younger patients and Asian patients [2-4].

According to a result of a Japanese multicenter retrospective study, the number of admissions for acute diverticulitis in Japan significantly increased over time; CD was detected mainly in both men and women aged 40 to 60 years, and 70.1% of patients had diverticulitis in the right colon [4]. In addition, the incidence of right-sided diverticulitis was over 80% in the younger group (<40 years), which is higher than that of the elderly group [4].

Interestingly, in this study, all cases were cecal diverticula; hence, we speculated that this result could suggest that cecal diverticula are congenital and supports the

hypothesis that cecal diverticula arise as saccular projections during the sixth week of embryonic development [5, 6].

Regarding the initial symptoms, some investigators believe that the longer duration of illness, absence of diarrhea and vomiting, and relative lack of toxicity are features of cecal diverticulitis [2, 3]. In this series, all cases had right lower quadrant abdominal pain, and 31.3% of the patients presented with nausea and vomiting; thus, the symptoms and signs of solitary cecal diverticulitis closely mimic those of acute appendicitis in children. On the contrary, no patient presented with diarrhea; thus, the absence of diarrhea might be one of the differences in symptoms between solitary cecal diverticulitis and acute appendicitis in children, as in the adult series of CD [2, 4, 7, 8].

Supposedly, it is difficult to distinguish between acute cecal diverticulitis and acute appendicitis [1, 3, 6, 9]. According to the European Association of Endoscopic Surgery (EAES) and the Society of American Gastrointestinal and Endoscopic Surgeons (SAGES) 2018 consensus conference on acute diverticulitis management, CT strongly recommended as the modality of choice, and alternatively, US could be used at centers with operators having expertise in this modality [2]. However, we believe that an appropriate preoperative diagnosis could be achieved by combining thorough anamnesis with special attention to the mode of symptom onset, with the aid of US and, if

necessary, confirmation by CT. In fact, we detected both cecal diverticula and normal appendices in 14 of 16 cases (87.5%) by US; therefore, we believe that thorough US examination by an expert sonographer and suspicion of the existence of diverticula around the cecum are important [10].

The optimal treatment for diverticulitis in children remains unknown because of the few reported cases of diverticulitis in children and their treatments, including surgical exploration and endoscopy [9, 11-13]. We could treat all cases with intravenous administration of antibiotics. The recurrence rate was 18.8%, and all three cases of recurrence were also treated conservatively. In addition, our results recommend the optimal follow-up period as 2 years (Table 1). Although our results may recommend the initial treatment of CD in children to be conservative, clinicians should recognize the fact that delayed diagnosis or misdiagnosis of other diseases, including perforated appendicitis, could result in unnecessary complications.

There were several limitations in our study. This study was a retrospective, non-randomized, single-center analysis; therefore, we could not identify asymptomatic CDs and cases of CD that were treated as appendicitis in our institutions.

In our study, all cases of CD were solitary cecal diverticulitis, and we observed that US could be useful in the diagnosis of cecal diverticulitis in children. Non-operative

treatment should be recommended as an initial treatment for CD in children. To increase the generalizability of study findings, future studies encompassing larger number of patients are needed.

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Authorship contribution:

T.H, and Y.O. managed the patient, and contributed to conception and study design of the manuscript; T.H and Y.O. collected and analyzed data. T.H and Y.O. drafted the manuscript; T.H, Y.W and Y.O. described figures and H.M, T.N, Y.N, C.H and Y.B reviewed the manuscript. All authors read and approved the final manuscript.

References

1 Carrano FM, Mauri S, Interdonato PF. Still Another Case of Right Lower Quadrant Abdominal Pain. *JAMA surgery*. 2017; **152**: 303-04.

2 Francis NK, Sylla P, Abou-Khalil M*, et al.* EAES and SAGES 2018 consensus conference on acute diverticulitis management: evidence-based recommendations for clinical practice. *Surgical endoscopy*. 2019; **33**: 2726-41.

3 Kurer MA. Solitary caecal diverticulitis as an unusual cause of a right iliac fossa mass: a case report. *Journal of medical case reports*. 2007; **1**: 132.

4 Manabe N, Haruma K, Nakajima A*, et al.* Characteristics of Colonic Diverticulitis and Factors Associated With Complications: A Japanese Multicenter, Retrospective, Cross-Sectional Study. *Diseases of the colon and rectum*. 2015; **58**: 1174-81.

5 Rodkey GV, Welch CE. Diverticulitis of the colon: evolution in concept and therapy. *The Surgical clinics of North America*. 1965; **45**: 1231-43.

6 Huntington JT, Brigode W, Thakkar RK, *et al*. A case of pediatric cecal diverticulitis mimicking acute appendicitis. *International journal of colorectal disease*. 2016; **31**: 147-8.

7 Horwitz JR, Gursoy M, Jaksic T, *et al*. Importance of diarrhea as a presenting symptom of appendicitis in very young children. *American journal of surgery*. 1997; **173**: 80-2.

8 Miyauchi H, Okata Y, Hatakeyama T, *et al*. Analysis of predictive factors of perforated appendicitis in children. *Pediatrics international : official journal of the Japan Pediatric Society*. 2020.

9 Cheng E, Cohen L, Gasinu S, *et al*. Cecal diverticulitis as a continuing diagnostic and management dilemma: a report of two cases in children. *Pediatric surgery international*. 2012; **28**: 99-102.

10 Chou YH, Chiou HJ, Tiu CM, *et al.* Sonography of acute right side colonic diverticulitis. *American journal of surgery*. 2001; **181**: 122-7.

11 Yano K, Muraji T, Hijikuro K, *et al*. Cecal diverticulitis: Two pediatric cases. *Pediatrics international : official journal of the Japan Pediatric Society*. 2019; **61**: 931-33.

12 Santohigashi K, Lewis K, Ho CH. It's Not Appendicitis! *The Journal of pediatrics*. 2016; **170**: 340-e1.

13 Rich BS, Cheng E, Cohen L, et al. Another case of pediatric cecal diverticulitis. *Pediatric surgery international*. 2012; **28**: 1243.

Figure legends

Figure 1. Ultrasonography for cecal diverticulitis

An outpouching diverticulum (arrow heads) from the lateral wall of the cecum (white arrows) with markedly increased echogenicity of the surrounding fat (a) and increase in arterial blood flow exhibiting a ring shape on color Doppler (b).

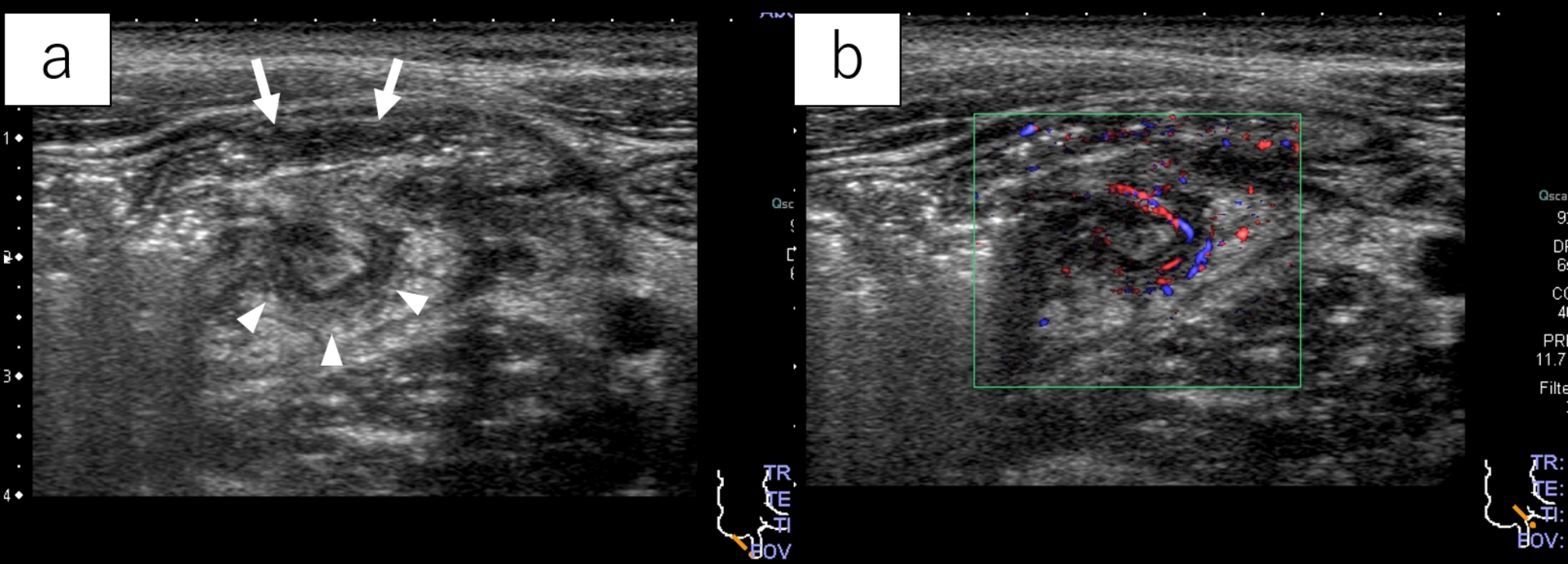
a
b

Table. Patient demographics, symptoms and findings of imaging studies.

No	Age (y)	Sex	Onset (days)	Symptoms				US/CT	US or CT Findings							Antibiotics (days)	Recurrence (months)
				Fever	Pain	Anorexia	Vomit		Thick-ness	Vascular flow	Ascites	Fat	Lymph	Stone	Abscess		
1	11	M	2	+	+	+	+	US	+	+		+				CMZ-5	17
2	8	M	1		+			US	+	+		+			+	CMZ-4	
3	13	F	4		+			US	+	+		+				CMZ-6	7
4	12	F	0		+	+	+	US	+	+	+	+		+		CMZ-4	
5	11	F	2	+	+	+	+	US	+	+		+				CMZ-6	
6	13	M	1	+	+			US	+	+	+	+	+			CMZ-3	18
7	9	F	2		+	+		US	+	+	+	+	+			CMZ-4	
8	9	F	0	+	+	+	+	CT(E)	+	+	+	+			+	CMZ-2→TAZ-7	
9	15	F	0		+			US	+	+		+				CMZ-7	
10	14	F	1		+	+	+	US	+	+	+	+	+	+		CMZ-5	
11	12	M	1		+			US	+	+		+				CMZ-5	
12	12	F	1	+	+	+		US	+	+	+	+		+	+	TAZ-15	
13	12	F	2		+			US	+	+		+				CMZ-2→TAZ-6	
14	13	M	1		+			CT	+	+		+				CMZ-8	
15	14	F	0		+			US	+	+		+				CMZ-5→SBTPC-3	
16	12	F	2	+	+	+		US	+	+		+				CMZ-3→FOM-7	

Onset: duration from onset of symptoms to admission, Pain: right quadrant abdominal pain, E: enhanced, Thickness: thickness of diverticulum wall, Vascular Flow: increased vascular flow of diverticulum wall, Fat: increased echo brightness of surrounding fatty tissue, Lymph: lymph node swelling, Stone: feces stone,

CMZ: cefmetazole, TAZ: tazobactam / piperacillin, SBT-ABPC: sulbactam / ampicillin, FOM: fosfomycin