

BRIEF ARTICLE

Image-guided conservative management of right colonic diverticulitis

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CONCLUSION: Our results indicate that right colonic diverticulitis is essentially benign and image-guided conservative treatment is primarily required.

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Key words: Ascending colon; Cecum; Medical therapy; Colonic diverticulitis

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Abstract

AIM: To study the clinical outcomes of medical therapy in patients with right colonic diverticulitis.

METHODS: The records of 189 patients with right colonic diverticulitis which was finally diagnosed by computed tomography, ultrasonography, or operative findings were retrospectively reviewed.

RESULTS: Of the 189 patients hospitalized for right colonic diverticulitis, the stages of diverticulitis by a modified Hinchey classification were 26 patients (13.8%) in stage 0, 139 patients (73.5%) in stage I a, 23 patients (12.2%) in stage I b, and 1 patient (0.5%) in stage III. Medical therapy was undertaken in 185 of 189 patients (97.9%). One hundred and eighty three of 185 patients were successfully treated with bowel rest and antibiotics. Two patients in stage I b required a resection or surgical drainage because of an inadequate response to conservative treatment. Recurrent diverticulitis developed in 15 of 183 patients (8.2%) who responded to medical therapy. All 15 patients who suffered a second attack had uncomplicated diverticulitis, and were successfully treated with medical therapy.

INTRODUCTION

Interestingly, there is a unique predilection for diverticular disease of the colon in Western and Asian populations, and is predominant in the left colon in Caucasians^[1], while much more common in the right colon in Asians^[2]. Many studies have focused on left colonic diverticulitis and subsequently, therapeutic guidelines have been established, while that of right colonic diverticulitis still remains controversial^[2-8]. In the past, the majority of patients with right colonic diverticulitis were faced with an operation for presumed appendicitis^[3,4,9]. Thus, there is a lack of objective information for patients with right colonic diverticulitis compared with left colonic diverticulitis. Much of this information is based on case series data, which have relatively small sample sizes and the preoperative diagnosis was not made using imaging studies. Recent studies suggest that colonic diverticulitis can be correctly diagnosed by computed tomography (CT) scan^[6,7,10], or ultrasonography (US)^[11-14], and with the use of these imaging studies, right colonic diverticulitis is more common than has been previously assumed^[7]. The aim of this study was to evaluate the clinical course and results of medical therapy in patients with right colonic diverticulitis, of which the final diagnosis was based on radiographic evidence from CT or US, or operative findings.

MATERIALS AND METHODS

Patients

Using computerized patient databases, we searched for all patients who were hospitalized with the diagnosis of colonic diverticulitis from January 1998 to August 2007 at Kyung Hee University Hospital, Seoul, Korea. Excluded were patients who were clinically suspected of having colonic diverticulitis without operative findings or radiologic evidence from CT or US, patients whose colonic diverticulosis alone was present without any evidence of inflammation, and those whose follow-up records were unobtainable. A total of 189 patients were retrospectively reviewed and data were collected with regard to age and sex, clinical presentation, location of disease, diagnostic studies (CT, US, barium enema, and colonoscopy), laboratory findings, type of complication, treatment modality, preoperative diagnosis, operative findings, type of operation, and outcome. The final diagnosis was based on radiographic evidence from CT or US, or operative findings. CT was performed in 138 patients (73%) and US was performed in 114 patients (60.3%). Both CT and US were performed in 80 patients (42.3%) and 17 patients underwent surgery without CT or US. Recurrence of diverticulitis was defined as the presence of the same symptoms and signs leading to re-hospitalization. Recurrence was tracked either by interviewing the patient or by telephone contact.

A modification of the Hinchey classification system was used to define the patients^{15,16}. Patients were categorized into the six stages according to CT, US, or operative findings. Complicated diverticulitis is defined as diverticulitis associated with abscess, fistula, obstruction, or free perforation¹⁷. Therefore, uncomplicated diverticulitis included stage 0 and I a, whereas complicated diverticulitis included stage I b, II, III, and IV.

The data were analyzed using the chi-square test or Fisher's exact test. All *P* values of less than 0.05 were considered to be statistically significant.

RESULTS

Characteristics and presentation of patients

Of the 189 patients hospitalized for right colonic diverticulitis, 111 were men and 78 were women. The median age of the patients was 37 years (range, 14–88 years). The mean age of women (40.4 years) was not significantly different from that of men (36.7 years) (*P* = 0.088). One hundred and eight patients (57.1%) were under the age of 40 years. By a modified Hinchey classification, stages of diverticulitis present on admission were as follows: 26 patients (13.8%) in stage 0, 139 patients (73.5%) in stage I a, 23 patients (12.2%) in stage I b, and 0 (0%), 1 (0.5%), 0 (0%) patient in stage II, stage III and stage IV, respectively (Table 1). The majority of patients commonly presented with phlegmon. The majority of patients (87.3%) had mild diverticulitis (stage 0 or I a) on admission and only 24 patients (12.7%) had complicated diverticulitis. The average white blood cell count was 11417 ± 275 . Fever was seen in 20.6% of patients.

Table 1 Presentation of patients by a modified Hinchey classification¹⁵

Modified Hinchey classification	Total (n = 189)
0 Direct visualization of the diverticulum with Sx or Sign ¹	26
I a Confined pericolic inflammation (phlegmon)	139
I b Confined pericolic abscess	23
II Distant intraabdominal or retroperitoneal abscess	0
III Generalized purulent peritonitis	1
IV Fecal peritonitis	0

¹Right abdominal pain, leukocytosis, or fever with no radiologic evidence of appendicitis. Sx: Symptom.

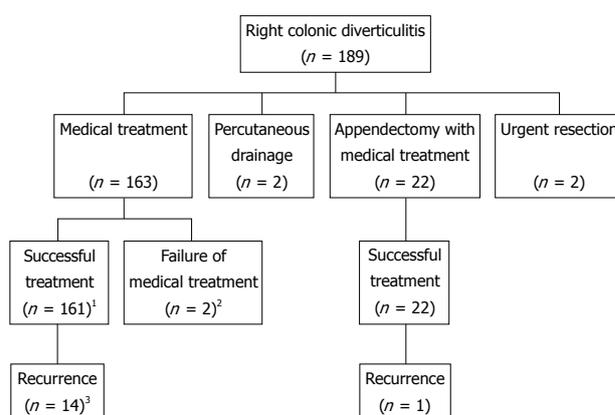


Figure 1 Treatment and outcome of 189 patients with right colonic diverticulitis. ¹After successful medical treatment, seven patients had elective surgery at the surgeon's request; ²One patient required a resection and another underwent surgical drainage; ³After successful medical treatment, five patients had elective surgery at the surgeon's request.

Treatment

Patients were initially managed with medical therapy alone, percutaneous drainage, or an urgent operation. Elective surgery was determined after a cooling-off period. Medical therapy was undertaken in 185 of 189 patients (97.9%), including 22 patients who incidentally underwent an appendectomy for presumed appendicitis (Figure 1). Two patients in stage I b underwent percutaneous drainage and two patients (one in stage I b and one in stage III) underwent urgent surgery (1 ileocecal resection, 1 right hemicolectomy). One hundred and eighty three of 185 patients were successfully treated with bowel rest and antibiotics. However, two patients in stage I b required a resection or surgical drainage because of an inadequate response to conservative treatment. Seven patients who were successfully treated with bowel rest and antibiotics had an elective operation at the surgeon's request.

Recurrence

Recurrent diverticulitis developed in 15 of 183 patients (8.2%) who responded to medical therapy. The median interval to the onset of recurrence was 11 mo (range, 0.5–96 mo). The median disease free period was 44 mo (range, 0.5–129 mo). All 15 patients who suffered a

second attack had uncomplicated diverticulitis, and were successfully treated with medical therapy. One patient, an 80-year-old woman, experienced five episodes of right colonic diverticulitis, which were uncomplicated and successfully treated with medical therapy. Five of these 15 patients had an elective operation at the surgeon's request after successful conservative treatment. There were no deaths in these patients with right colonic diverticulitis.

Pathology and follow-up study

A total of 15 patients underwent colonic resection. Nine of these 15 patients were reported to have multiple false diverticula. The pathologic reports of the other six patients contained no mention of the type of diverticulum.

During the original hospitalization, CT or US was supplemented by colonoscopy or double-contrast barium enema in 31 patients. In addition, 1 mo after recovery from an initial episode of diverticulitis, 60 patients agreed to re-evaluation by double-contrast barium enema (54 patients) or colonoscopy (six patients). In a total of 87 patients, including four patients duplicated, multiple diverticula were reported in 62 patients (71.3%) and a solitary diverticulum was reported in 13 patients (14.9%). The number of diverticulum could not be identified in 12 patients due to poor bowel preparation.

DISCUSSION

The Hinchey classification and its several modifications have been used to define the stages of acute diverticulitis although the systems were mostly applied to left colonic diverticulitis^[15,18]. In the present study, the diagnosis of right colonic diverticulitis was made in 167 of 172 (97%) patients using CT or US. The original Hinchey classification is not detailed enough to reflect right colonic diverticulitis with which the majority of patients have mild forms. We therefore used a modified system including subcategories in the early stage^[15,16]. The majority of patients (87.3%) had uncomplicated diverticulitis (stage 0 or I a) on admission and the other patients even those with complicated diverticulitis had a relatively early stage (stage I b) such as pericolic abscess with the exception of one patient (stage III).

To date, no therapeutic guidelines for patients with right colonic diverticulitis have been established^[5,6,9,19-21]. In contrast, practice parameters for the treatment of left colonic diverticulitis do exist^[17]. Conservative treatment is recommended for uncomplicated left colonic diverticulitis because it results in resolution of the problem in 70% to 100% of patients^[22-29]. In our study, all of the 165 patients with uncomplicated right colonic diverticulitis (stage 0 or I a) were successfully treated with bowel rest and antibiotics, including 22 patients who underwent an appendectomy for presumed appendicitis. We believe that patients with uncomplicated right colonic diverticulitis can be successfully treated with medical treatment in the same way as those with uncomplicated left colonic diverticulitis.

However, some authors advocate surgical resection for right colonic diverticulitis encountered during surgery

for presumed appendicitis^[3-5]. Lo *et al*^[3] reported their experience of 22 patients over an 11-year period. They performed preoperative US and CT in only one patient. At operation, an inflammatory phlegmon or indurated mass was found in 18 patients, however, colectomy with primary ileocolic anastomosis was performed in 21 patients including these 18 patients. Lane *et al*^[4] reported a series of 49 patients over a 22-year period. The authors stated that because the pathophysiology of cecal diverticula may be different in the Asian population and the recurrence of symptoms may be more common in the Western population, conservative management may not be applicable to the Western population. A correct radiologic diagnosis was preoperatively made in only three patients. Immediate right hemicolectomy was performed in 39 patients at the time of laparotomy, but operative findings or the severity of diverticulitis was not provided. Fang *et al*^[5] analyzed 85 patients during a 5-year period. Thirty four patients had right hemicolectomy, 9 patients had diverticulectomy, and 42 patients received conservative treatment (antibiotics or appendectomy plus antibiotics). In 34 patients receiving right hemicolectomy, the indications for surgery included repeated attack of symptoms in six and phlegmon, abscess, or perforation of the diverticulum in ten. In 42 patients receiving conservative treatment, ten patients developed recurrent diverticulitis and only three of these ten patients had complicated diverticulitis. However, the authors mentioned that the disease process of cecal diverticulitis might not be benign and recurrence of diverticulitis should be an indication for aggressive resection. In the above studies, we guess that all patients who underwent colonic resection would not essentially require surgery, and conservative treatment alone might have been sufficient in some patients. We believe that the correct pretreatment diagnosis for right colonic diverticulitis does not only avoid unnecessary surgery but also allows clinicians to determine optimal management according to the severity of the diverticulitis.

It is uncertain whether the pathophysiology of right colonic diverticulitis is really different between Asian and Western populations. Oudenhoven *et al*^[7] reviewed 44 patients with right colonic diverticulitis in a Western population (including one Asian patient). Forty one patients were successfully treated conservatively and three patients underwent diverticulectomy. They concluded that the natural history of right colonic diverticulitis is benign and surgical intervention can be avoided in the vast majority of patients. In a large post-mortem survey of diverticular disease, Hughes^[1] reported that the incidence of solitary cecal diverticula lies between 2.5% and 5%. Histologically all the diverticula were thin-walled, false diverticula and no case of cecal diverticulum had muscle in its wall. The author mentioned that congenital cecal diverticulum may largely be a pathological myth. Graham and Ballantyne^[9] reviewed the American experiences. Among 128 histologic cases compiled from the medical literature, they found that 52 (41%) were true diverticula while 76 (59%) were, in fact, false diverticula. In addition, among 288 cases gathered from the literature, 233 (81%) were solitary, while 55 (19%) were multiple. In the

present study, nine of 15 patients who underwent colonic resection were reported to have multiple false diverticula. Of 87 patients receiving double-contrast barium enema or colonoscopy, multiple diverticula were reported in 62 patients (71.3%) and solitary diverticulum was reported in 13 patients (14.9%). The incidence of true or false diverticula in the right colon is not well known, particularly between Western and Asian populations. This is because the pathologic differentiation between true and false diverticula may be difficult once inflammation occurs^[4], and to our knowledge, the type of diverticula in right colonic diverticulitis has not been pathologically described in the Asian literature.

Some authors who advocate aggressive resection for right colonic diverticulitis assert that leaving the diseased foci *in situ* with the possibility of developing some serious complications later seems to be impractical and recurrence of diverticulitis should be an indication for aggressive resection. If recurrence is high and complications frequent, surgical resection is essentially required. However, after successful conservative treatment, a recurrence rate of 3.6% to 23.8% has been reported in the literature^[5,7,8,20,21,30]. Ngoi *et al.*^[31] reported a recurrence rate of 1.5%, but 38% of their patients underwent diverticulectomy. It is interesting to note that in these studies, there was little complicated diverticulitis in recurrent cases: Fang *et al.*^[5] reported three complicated cases in 10 recurrences in 42 patients receiving conservative treatments, and Harada *et al.*^[30] reported one complicated case in four recurrences in 29 patients. The other authors reported that all of the recurrent cases were uncomplicated diverticulitis, which responded well to medical therapy. Komuta *et al.*^[8] mentioned that recurrent uncomplicated right colonic diverticulitis responded well to medical therapy regardless of the number of recurrences. In our study, 15 of 183 patients (8.2%) who responded to medical therapy developed recurrent diverticulitis. All 15 patients had uncomplicated diverticulitis, and were successfully treated with medical therapy. Therefore, we believe that if the recurrence rate after conservative treatment is not high and if complications are not frequent even after recurrence occurs, recurrence of right colonic diverticulitis should initially be an indication for medical treatment and not for surgery.

In conclusion, our results indicate that right colonic diverticulitis is essentially benign and image-guided conservative treatment is primarily required. Although our study is limited by the retrospective design and relatively few recurrent patients, our results suggest that recurrence after conservative treatment of right colonic diverticulitis is low, and rarely associated with complicated diverticulitis. Thus, recurrence of right colonic diverticulitis should initially be an indication for medical treatment, while surgical resection should be selectively considered for patients with complicated diverticulitis.

is much more common in Asian populations. There is a lack of information available on the clinical course and results of medical therapy for patients with right colonic diverticulitis compared with left colonic diverticulitis.

Research frontiers

The final diagnosis of all patients with right colonic diverticulitis was based on radiographic evidence from computed tomography or ultrasonography, or operative findings. The majority of patients with right colonic diverticulitis had a mild form on admission and initially required medical therapy. Recurrent diverticulitis developed in 8.2%, but all recurrent patients had uncomplicated diverticulitis, and were successfully treated with medical therapy.

Innovations and breakthroughs

Right colonic diverticulitis is essentially benign and image-guided conservative treatment is primarily required. The correct pretreatment diagnosis for right colonic diverticulitis does not only avoid unnecessary surgery but also allows clinicians to determine optimal management according to the severity of the diverticulitis. Even recurrence of right colonic diverticulitis should initially be an indication for medical treatment, while surgical resection should be selectively considered for patients with complicated diverticulitis.

Terminology

Complicated diverticulitis is defined as diverticulitis associated with abscess, fistula, obstruction, or free perforation.

Peer review

This is an interesting study about right colonic diverticulitis management that has been quite rarely discussed.

REFERENCES

- 1 Hughes LE. Postmortem survey of diverticular disease of the colon. I. Diverticulosis and diverticulitis. *Gut* 1969; **10**: 336-344
- 2 Sugihara K, Muto T, Morioka Y, Asano A, Yamamoto T. Diverticular disease of the colon in Japan. A review of 615 cases. *Dis Colon Rectum* 1984; **27**: 531-537
- 3 Lo CY, Chu KW. Acute diverticulitis of the right colon. *Am J Surg* 1996; **171**: 244-246
- 4 Lane JS, Sarkar R, Schmit PJ, Chandler CF, Thompson JE Jr. Surgical approach to cecal diverticulitis. *J Am Coll Surg* 1999; **188**: 629-634; discussion 634-635
- 5 Fang JF, Chen RJ, Lin BC, Hsu YB, Kao JL, Chen MF. Aggressive resection is indicated for cecal diverticulitis. *Am J Surg* 2003; **185**: 135-140
- 6 Katz DS, Lane MJ, Ross BA, Gold BM, Jeffrey RB Jr, Mindelzun RE. Diverticulitis of the right colon revisited. *AJR Am J Roentgenol* 1998; **171**: 151-156
- 7 Oudenhoven LF, Koumans RK, Puylaert JB. Right colonic diverticulitis: US and CT findings--new insights about frequency and natural history. *Radiology* 1998; **208**: 611-618
- 8 Komuta K, Yamanaka S, Okada K, Kamohara Y, Ueda T, Makimoto N, Shiogama T, Furui J, Kanematsu T. Toward therapeutic guidelines for patients with acute right colonic diverticulitis. *Am J Surg* 2004; **187**: 233-237
- 9 Graham SM, Ballantyne GH. Cecal diverticulitis. A review of the American experience. *Dis Colon Rectum* 1987; **30**: 821-826
- 10 Jang HJ, Lim HK, Lee SJ, Lee WJ, Kim EY, Kim SH. Acute diverticulitis of the cecum and ascending colon: the value of thin-section helical CT findings in excluding colonic carcinoma. *AJR Am J Roentgenol* 2000; **174**: 1397-1402
- 11 Liljegen G, Chabok A, Wickbom M, Smedh K, Nilsson K. Acute colonic diverticulitis: a systematic review of diagnostic accuracy. *Colorectal Dis* 2007; **9**: 480-488
- 12 Pradel JA, Adell JF, Taourel P, Djafari M, Monnin-Delhom E, Bruel JM. Acute colonic diverticulitis: prospective comparative evaluation with US and CT. *Radiology* 1997; **205**: 503-512
- 13 Chou YH, Chiou HJ, Tiu CM, Chen JD, Hsu CC, Lee CH, Lui WY, Hung GS, Yu C. Sonography of acute right side colonic diverticulitis. *Am J Surg* 2001; **181**: 122-127
- 14 Hollerweger A, Macheiner P, Rettenbacher T, Brunner W, Gritzmann N. Colonic diverticulitis: diagnostic value and appearance of inflamed diverticula-sonographic evaluation. *Eur Radiol* 2001; **11**: 1956-1963

COMMENTS

Background

Right colonic diverticulitis is a rare condition in Western populations, while it

- 15 **Wasvary H**, Turfah F, Kadro O, Beauregard W. Same hospitalization resection for acute diverticulitis. *Am Surg* 1999; **65**: 632-635; discussion 636
- 16 **Kaiser AM**, Jiang JK, Lake JP, Ault G, Artinyan A, Gonzalez-Ruiz C, Essani R, Beart RW Jr. The management of complicated diverticulitis and the role of computed tomography. *Am J Gastroenterol* 2005; **100**: 910-917
- 17 **Wong WD**, Wexner SD, Lowry A, Vernava A 3rd, Burnstein M, Denstman F, Fazio V, Kerner B, Moore R, Oliver G, Peters W, Ross T, Senatore P, Simmang C. Practice parameters for the treatment of sigmoid diverticulitis--supporting documentation. The Standards Task Force. The American Society of Colon and Rectal Surgeons. *Dis Colon Rectum* 2000; **43**: 290-297
- 18 **Hinchey EJ**, Schaal PG, Richards GK. Treatment of perforated diverticular disease of the colon. *Adv Surg* 1978; **12**: 85-109
- 19 **Markham NI**, Li AK. Diverticulitis of the right colon--experience from Hong Kong. *Gut* 1992; **33**: 547-549
- 20 **Yang HR**, Huang HH, Wang YC, Hsieh CH, Chung PK, Jeng LB, Chen RJ. Management of right colon diverticulitis: a 10-year experience. *World J Surg* 2006; **30**: 1929-1934
- 21 **Moon HJ**, Park JK, Lee JI, Lee JH, Shin HJ, Kim WS, Kim MS, Jeong JH. Conservative treatment for patients with acute right colonic diverticulitis. *Am Surg* 2007; **73**: 1237-1241
- 22 **Parks TG**, Connell AM. The outcome in 455 patients admitted for treatment of diverticular disease of the colon. *Br J Surg* 1970; **57**: 775-778
- 23 **Larson DM**, Masters SS, Spiro HM. Medical and surgical therapy in diverticular disease: a comparative study. *Gastroenterology* 1976; **71**: 734-737
- 24 **Haglund U**, Hellberg R, Johnsen C, Hultén L. Complicated diverticular disease of the sigmoid colon. An analysis of short and long term outcome in 392 patients. *Ann Chir Gynaecol* 1979; **68**: 41-46
- 25 **Thompson WG**, Patel DG. Clinical picture of diverticular disease of the colon. *Clin Gastroenterol* 1986; **15**: 903-916
- 26 **Cheskin LJ**, Bohlman M, Schuster MM. Diverticular disease in the elderly. *Gastroenterol Clin North Am* 1990; **19**: 391-403
- 27 **Detry R**, Jamez J, Kartheuser A, Zech F, Vanheuverzwijn R, Hoang P, Kestens PJ. Acute localized diverticulitis: optimum management requires accurate staging. *Int J Colorectal Dis* 1992; **7**: 38-42
- 28 **Hachigian MP**, Honickman S, Eisenstat TE, Rubin RJ, Salvati EP. Computed tomography in the initial management of acute left-sided diverticulitis. *Dis Colon Rectum* 1992; **35**: 1123-1129
- 29 **Kellum JM**, Sugeran HJ, Coppa GF, Way LR, Fine R, Herz B, Speck EL, Jackson D, Duma RJ. Randomized, prospective comparison of cefoxitin and gentamicin-clindamycin in the treatment of acute colonic diverticulitis. *Clin Ther* 1992; **14**: 376-384
- 30 **Harada RN**, Whelan TJ Jr. Surgical management of cecal diverticulitis. *Am J Surg* 1993; **166**: 666-669; discussion 669-671
- 31 **Ngoi SS**, Chia J, Goh MY, Sim E, Rauff A. Surgical management of right colon diverticulitis. *Dis Colon Rectum* 1992; **35**: 799-802

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