

Effectiveness of computerized tomography in the management of right colon diverticulitis treatment

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Abstract

Aim: Symptoms of right colon diverticulitis may mimic acute appendicitis. Therefore, most of these patients undergo unnecessary surgical intervention due to suspicion of appendicitis. The aim of this study was to evaluate the clinical and treatment results of our patients with right colon diverticulitis.

Material and Methods: Between January 2016 and December 2020, demographic and clinical data of 15 patients diagnosed with right-sided colon diverticulitis among 104 patients with colonic diverticulitis were retrospectively analyzed and radiological evaluation and clinical findings were recorded.

Results: Fifteen patients were included from in the study. The mean age of the patients was 37.73, 9 (60%) were female and 6 (40%) were male. The duration of symptoms before hospitalization was 1-4 days, with an average of 2.2 days. Generally, 66.6% of the patients had fever, 46.6% had nausea, 33% had diarrhea, 73% had pain in the lower right abdomen, and 27% had general abdominal pain at the time of admission. Leukocytosis was detected in 86.6% of all patients. High CRP levels were found in all patients (100%). Since two patients had an ultrasound image compatible with acute appendicitis, surgery was performed without computed tomography. In these two patients, Hinchey-1b cecum diverticulitis was found as a surgical finding. Computed tomography with oral and intravenous contrast was used for all other patients. Diagnostic laparoscopy was performed on the computed tomography of a patient after suspicious findings accompanying cecum diverticulitis. In one patient, diverticulitis in the cecum and abscess in the right colon medial was observed (Hinchey-2). This patient underwent percutaneous drainage and IV antibiotherapy accompanied by interventional radiology, and the treatment was successful. In one patient, right hemicolectomy and ileocolic anastomosis were performed due to complicated right colon diverticulitis and acute abdomen (Hinchey 3). Although ultrasound evaluation was performed on all patients, the diagnosis of diverticulitis could not be made clearly for 8 (53.3%) patients. According to localization, 66.6% of patients had diverticulitis in the right colon (except cecum) and 33.3% had diverticulitis in the cecum.

Conclusion: In experienced hands, ultrasonography can make it easier to differentiate diverticulitis from acute appendicitis, however, in suspected cases, CT is of great importance to determine the correct diagnosis and suspected complications necessary to choose the right treatment. Acute appendicitis and right colon diverticulitis can be confused, especially cecal diverticulitis, and uncomplicated cecal diverticulitis can usually be managed conservatively.

Keywords: Hinchey classification; mimicking apendicitis; right diverticulitis

INTRODUCTION

Colonic diverticular disease, which was first described by Cruvelheier in 1849, is defined as the outwardly sac-like displacement of the colon mucosa. Cases with more than one diverticulum in the colon are called diverticulosis(1). Characteristically, colonic diverticular disease generally occurs at over 50 years old, localized in the left and sigmoid colon (over 95%) in most cases, with a higher incidence in Western societies. In contrast, generally right colon diverticula are mostly seen before the age of 50. The most common complication of colonic diverticular disease is diverticulitis and occurs in 15-25% of cases (1,2). The right colon diverticula are usually solitary and

congenital (3). Right colon diverticulitis is a rare condition that causes right iliac fossa pain in cases applying to the emergency room. They mostly undergo additional surgical interventions by imitating acute appendicitis and acute abdomen. Being rare and being able to be treated with medical treatment are important features of right colon diverticulitis.

The purpose of this study: Determining the effectiveness of imaging methods for the evaluation of patients who have applied to our clinic in the last 4 years and who have been diagnosed with preoperative and peroperative right colon diverticulitis, and to be able to apply medical treatment while avoiding unnecessary surgery.

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MATERIAL and METHODS

Following the acceptance of the local ethics committee regarding the study, 104 patients with diverticulitis who were admitted to our hospital in January 2016-December 2020 were identified retrospectively and included in the study. Informed consent was obtained from all of the patients. Patients with concomitant colon cancer or pregnancy were excluded from the study. Right colon diverticulitis was found in 15 of these patients. Age, gender, additional disease, previous surgery, and additional findings were recorded. Patients were evaluated with complete blood count, CRP, radiological findings and surgical findings. Hinchey staging: patients were staged according to radiological evaluation and clinical findings.

Statistical analysis

The analysis of data was performed with the SPSS 22.0 (Armonk, NY, USA) program, and the average, standard deviation, lowest, and highest values were used in the descriptive statistics.

Hinchey Classification

Stage 1a: Flegmon (inflammation)

Stage 1b: Diverticulitis + pericolic or mesenteric abscess

Stage 2: Diverticulitis + pelvic abscess (limited abscess in the pelvis)

Stage 3: Diverticulitis + suppurative peritonitis (peritonitis not associated with intestinal lumen)

Stage 4: Diverticulitis + fecal peritonitis (intestinal lumen-associated peritonitis)

It was observed that the patients were managed with conservative, minimally invasive methods or treatment methods such as surgical intervention. Percutaneous drainage with a minimally invasive method was also considered as a conservative treatment.

RESULTS

Fifteen patients were included from 104 patients with diverticulitis in the study. The mean age of the patients was 37.73 and the age range was between 21 and 72, 9 (60%) were female and 6 (40%) were male. The duration of symptoms before hospitalization was 1-4 days, with an average of 2.2 days. Generally, 66.6% of the patients had fever, 46.6% had nausea, 33% had diarrhea, 73% had pain in the lower right abdomen, and 27% had general abdominal pain at the time of admission (Table 1). Leukocytosis was detected in 86.6% of all patients. High CRP levels were found in all patients (100%) (Table 2).

Since two patients underwent an ultrasound image compatible with acute appendicitis, one underwent appendectomy and then medical treatment, and the other with appendectomy and cecal diverticulectomy. These two patients were peroperatively found to have Hinchey-1b cecum diverticulitis and who were operated

on with a preliminary diagnosis of acute appendicitis, had cecum diverticulitis. Computed tomography with oral and intravenous contrast was used for all other patients. In one patient, suspicious findings were detected with acute appendicitis accompanying cecal diverticulitis on computed tomography (Figure 1). Diagnostic laparoscopy and laparoscopic drainage were performed in this patient, and appendectomy was not required (Figure 2). In one patient diverticulitis in the cecum and abscess in the right colon medial was observed (Hinchey 2). This patient underwent percutaneous drainage and IV antibiotherapy accompanied by interventional radiology and the treatment was successful.

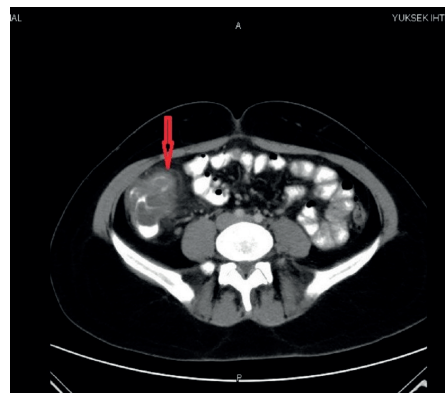


Figure 1. Cecum Diverticulitis (Hinchey 1b) Computed Tomography Image

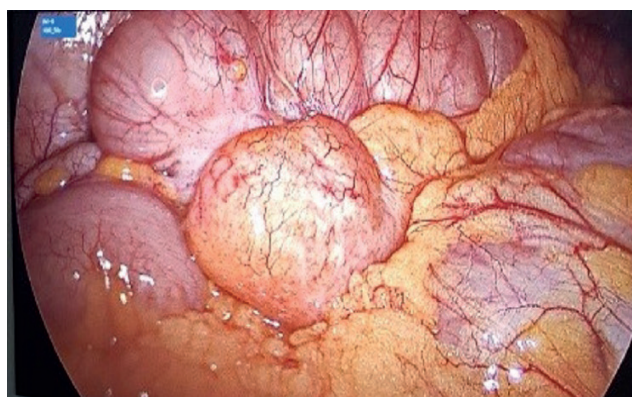


Figure 2. Cecum Diverticulitis (Hinchey 1b) Laparoscopic Image



Figure 3. Cecum Diverticulosis Colonoscopic Image

Table 1. Baseline Characteristics of Right-sided Colonic Diverticulitis Patients

		n:15	%
Gender	male	6	40.0
	female	9	60.0
Fever \geq 38°C	yes	10	66.7
	no	5	33.3
Nausea	yes	7	46.7
	no	8	53.3
Diarrhea	yes	5	33.3
	no	10	66.7
Pain	Generalized	4	26.7
	Localized in the right quadrant	11	73.3
Location	Caecum	5	33.3
	Right colon (non-caecum)	10	66.7
CT	Yes and Specific diagnosis (+)	13	86.7
	no	2	13.3
USG	yes	15	100.0
	yes.Specific diagnosis (+)	7	53.3
	yes.Specific diagnosis (-)	8	46.6
Hinchey classification	stage 1A	4	26.7
	stage 1B	9	60.0
	stage 2	1	6.7
	stage 3	1	6.7
	Stage 4	0	0
Surgery	yes	4	26.7
Surgical approach	Hemicolectomy	1	6.7
	Appendectomy	1	6.7
	Diagnostic Laparoscopy+ drainage	1	6.7
	Appendectomy and diverticulectomy	1	6.7
	no	11	73.3
Minimally invasive	Percutaneous drainage	1	6.7
Medical treatment (only)	yes	10	66.6

Table 2. Age, duration of application, and blood values of patients with right colon diverticulitis

	Average	Sd.	Minimum	Maximum
Age	37.73	13.26	21.00	72.00
Duration of symptoms	2.20	0.92	1.00	4.00
WBC	14342.00	2911.29	9400.00	19650.00
CRP	82.80	42.94	17.00	156.00

One patient underwent laparotomy due to complicated right colon diverticulitis and acute abdomen (Hinchey 3). This patient underwent right hemicolectomy and ileocolic anastomosis. Other patients received medical treatment only (iv antibiotherapy) and were discharged with follow-up. Although ultrasound evaluation was performed on all patients, the diagnosis of diverticulitis could not be clearly made for 8 (53.3%) patients. According to localization, 66.6% of patients had diverticulitis in the right colon

(non- cecum) and 33.3% had diverticulitis in the cecum. By staging the acute diverticulitis, four patients were accepted as Hinchey1a, nine patients as Hinchey 1b, one patient w as Hinchey 2 and one as Hinchey 3.

All but one patient underwent colonoscopic examination within 6-8 weeks following acute treatment. Two of these patients had hyperplastic polyp and low grade dysplasia polyp. No patients had colon tumors on colonoscopic examination (Figure 3).

DISCUSSION

The term "diverticulitis" refers to inflammation of a diverticulum, or diverticulum commonly accompanied by gross or microscopic perforation. It may be divided into two groups as left colon diverticulitis if it originates from the left colon diverticulum, and right colon diverticulitis if it originates from the right colon diverticulum. While 85% of patients with colonic diverticular disease are asymptomatic, acute diverticulitis attacks occur in approximately 4-15% of patients (4).

The right colonic and cecal diverticulum is believed to be congenital. It develops in the sixth week of pregnancy and is a true diverticulum covering all three layers of the colon. The terms "diverticulosis" and "diverticular disease" are used to describe the presence of non-inflammatory diverticulum. Since right colon diverticulitis is congenital, it is observed at a younger age than left colon diverticulitis (5,6). Acute colonic diverticulitis is a disease with a wide range of clinical manifestations, from mild, subclinical inflammation to general peritonitis. Most cases of acute diverticulitis are simple, uncomplicated and heal well with oral intake restriction and antibiotherapy. However, 25% of acute diverticulitis cases progress to complex diverticulitis with a risk of phlegmon, abscess, fistula, obstruction, bleeding or perforation (7). It is difficult to distinguish cecal diverticulitis from acute appendicitis based on the clinical picture. Symptoms such as right iliac fossa pain and tenderness and laboratory findings such as leukocytosis and high C-reactive protein do not increase the likelihood of establishing the correct diagnosis. Unlike typical appendicitis, a relatively long-lasting history of pain in the lower right quadrant and its stable localization without arising from the epigastrium can help with further separation. Unfortunately, in many cases, these signs do not allow reliable differential diagnosis (8).

Some recommended clinical features that can help distinguish diverticulitis from appendicitis include a longer history of abdominal pain without toxicity, less frequent vomiting, and tenderness with deep palpation (9-11).

For right colon diverticulitis, other differential diagnoses other than acute appendicitis include infectious or inflammatory colitis, advanced cecal malignancy, inflammatory bowel disease (especially Crohn's disease), pelvic inflammatory disease, tubal pregnancy, and cystitis (9). Radiological imaging plays an important role in the diagnosis of diverticulum disease and diverticulitis.

Since cecal diverticulitis is rare in western countries, there is a lack of experience in the sonographic evaluation of this disease. In addition, accurate ultrasonographic diagnosis rates, small diverticulum size, obesity, tenderness in the right lower abdominal quadrant and presence of intestinal gases leading to suboptimal USG examination may be negatively affected. The usefulness of ultrasound in detecting cecal diverticulitis is controversial. Some authors from Asia report 89-91% and 99-100% sensitivity and specificity, while others report rather low rates

with misdiagnosis leading to unnecessary surgery for suspected appendicitis (12). However, in the presence of inflammation, it has been reported that CT cannot distinguish between cecal diverticulitis and cecal cancer in 10% of cases (13).

Colonoscopy has also been an imaging method used to investigate colorectal conditions, but has no role in acute diverticulitis due to the risk of puncture of the inflamed bowel (14). Colonoscopy is preferred after the acute inflammatory process regresses (4-6 weeks) in order to exclude underlying colon malignancy, which may give similar images on CT.

MRI is not popular for use in the diagnosis of diverticulitis. However, some studies have shown that MRI has been successfully used for the correct diagnosis of right colon diverticulitis (15). MRI is generally preferable for non-diagnostic ultrasound results and for patients without CT. Computed tomography (CT) imaging is the most preferred diagnostic method in acute colonic diverticulitis and has high sensitivity (93-97%) and specificity (100%) (16,17).

Signs of diverticulitis recorded during computed tomography include thickening of the cecal wall, focal peri-cecal inflammation extending to the adjacent fascia, diverticulitis-related abscess, extraluminal air and mass. In the differential diagnosis between acute appendicitis and cecal diverticulum, the sensitivity and specificity of computed tomography has been reported as 98% in various studies (18,19).

Intramural inflammation, pericolic and intraperitoneal inflammation degree, all of the abscess, and perforation can be captured on CT scan. CT can also predict future complications after the first medical treatment and predict the need for surgical intervention after acute presentation. Therefore, it is very important in surgical planning and treatment management as well as in diagnosis (20).

Hinchey classification is widely used in CT screening for grading acute diverticulitis severity; stage Ia is indicative of limited pericolic inflammation (phlegmon), whereas stages Ib, II, III and IV indicate the presence of an abscess or peritonitis. Morbidity and mortality increase as the stage increases. Mortality is as low as 5% in stage I or II, but is quite high in stage III and stage IV (21). Conditions affecting mortality are important not only for the radiological staging of diverticulitis, but also for factors related to the patient: being over 50, leukocytosis, smoking, comorbid diseases and left colon diverticulitis are risk factors for severe diverticulitis (22). Computed tomography is of great importance for the diagnosis of right colon diverticulitis and its distinction from acute appendicitis (23). If the patient's clinical condition does not improve, colon resection and primary anastomosis can be planned (24).

Although conservative treatment is accepted for Hinchey 1-2 patients, laparoscopic diverticulectomy may be an alternative, according to the study of Luu et al (25). In cases where right colon diverticulitis is solitary, it

is recommended in some publications as another alternative to undergo diverticulectomy as it causes fewer complications (26).

Hinchey Stage II patients have pericolic, pelvic and retroperitoneal limited abscesses, but if the abscess is <5 cm and the general condition of the patient is good, they can heal with conservative medical treatment (27). Otherwise, colon resection is performed with primary anastomosis (27). In 14% of complicated Hinchey Stage II patients, colon diverticulitis can lead to colonic, colovaginal and colorectal fistulas, and additional surgical procedures may be required (28). Hinchey Grade III colon diverticulitis is associated with purulent peritonitis, has a mortality rate of 15-35% and a morbidity rate of 70-80%. In these patients, segment colectomy with laparotomy is recommended as emergency surgery (28). Hinchey Stage IV colon diverticulitis has fecal peritonitis and the mortality rate is 6 times higher than purulent peritonitis (29). Operation preferences in these patients should be open laparotomy, peritoneal lavage, segmental colectomy and stoma (29).

LIMITATIONS

In this study; retrospective collection of patients, right colon diverticulitis as a rare disease and absence of a multicenter study are our limitations.

CONCLUSION

Right colon diverticulitis, especially cecal diverticulitis, is a rare but possibly under-diagnosed disease group in Western countries. Due to nonspecific clinical symptoms, patients may be misdiagnosed preoperatively and exposed to an extra surgical burden. In experienced hands, ultrasonography can make it easier to differentiate diverticulitis from acute appendicitis, however, in suspected cases, CT is of great importance to determine the correct diagnosis and suspected complications necessary to choose the right treatment. It should be noted that acute appendicitis and right colon diverticulitis can be confused, especially cecal diverticulitis.

Uncomplicated cecal diverticulitis can usually be managed conservatively. Surgical intervention is recommended in the presence of large abscesses, and for those who have free perforation with purulent or fecal peritonitis, and in all these distinctions, management is carried out under the guidance of tomography.

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