

Effectiveness of conservative approach in right colon diverticulitis

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ABSTRACT

BACKGROUND: Approximately 10%–25% of patients with colon diverticular disease experience colonic diverticulitis during their lives. Right-sided diverticulosis is a rare condition in Western countries, but it is common among Asian countries. The aim of this study was to evaluate the clinical and treatment outcomes in our patients with right colon diverticulitis.

METHODS: Demographic and clinical data of 22 patients with a diagnosis of cecum and right-sided colon diverticulitis between 2014 and 2017 were analyzed. The Hinchey staging was applied according to the radiological evaluation and clinical findings. Then, the proportions of demographic and clinical features of the patients according to the Hinchey staging and its statistical significance were evaluated.

RESULTS: Our study included 22 patients who suffered from right colon diverticulitis. The female-to-male ratio was 0.69. A total of 68.1% of the patients were the Hinchey Stage I, and 31.8% were the Hinchey Stage II, all of which were evaluated by tomography. The Hinchey Stage I diverticulitis was mostly found in the right colon (66.7%) and the Hinchey Stage II diverticulitis in the cecum (57.1%). The mean age of the Hinchey Stage II patients was higher (63.6 years) and statistically significant ($p < 0.05$). Two patients had appendectomy, and one had right hemicolectomy. Conservative treatment was applied to other 19 patients. The mean hospitalization time was 3.4 days. Four patients who received conservative treatment at the 2-year follow-up had recurrence. No recurrence was observed in patients receiving surgical treatment.

CONCLUSION: Right colon diverticulitis is usually seen in solitary men aged <50 years from Eastern societies. As a treatment option, conservative methods should be preferred, especially in uncomplicated cases. Surgical treatment is usually used in the treatment of recurrent and complicated cases.

Keywords: Conservative treatment; Hinchey staging; right colon diverticulitis.

INTRODUCTION

In the case of colonic diverticula, the colon mucosa is dislodged in the form of an outward pouch. The cases in which more than one diverticulum exists are called diverticulosis coli.^[1] Colonic diverticular disease (CDD) was first defined by Cruvelhier in 1849.^[1]

The prevalence of CDD is 5%–45% in the Western societies.^[2] It usually occurs after 50 years of age and is located in the left-sigmoid colon in 95% of the cases.^[1,2] In approximately 1.5%

of the cases, it is located in the right colon.^[1,2] The prevalence of CDD is 0.2% in Asia and 0.2% in Africa.^[1] It usually occurs before 50 years of age, and in 70% of the cases, it is found in the right colon.^[1–3] Diverticulitis is the most common CDD complication, and it occurs in 15%–25% of the cases.^[1,2]

Right colon diverticulitis (RCD) is usually solitary and congenital.^[4] RCD generally occurs in middle-aged men, and its incidence does not increase with age.^[5] It is difficult to distinguish RCD from acute appendicitis because of their similar symptoms and signs.

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The aim of the present study was to evaluate the patients with RCD using clinical, laboratory, imaging, and treatment methods in one center. The efficacy of conservative treatment in RCD was evaluated.

MATERIALS AND METHODS

Patients with RCD among patients with colon diverticulitis followed in the Department of General Surgery between 2011 and 2015 were retrospectively reviewed. In the present study, it was found that 152 patients received treatment for CDD. The patients without RCD, those who had additional pathologies such as colon tumor, those who were pregnant, and those with incomplete data were excluded from the study. Patients diagnosed as having RCD after the operation with a preliminary diagnosis of appendicitis were included in the study.

Twenty-two cases with RCD meeting the inclusion criteria were detected. Age, gender, symptoms, the symptom duration, laboratory results, radiological findings, and treatments of patients were retrospectively analyzed. A body temperature $>38.2^{\circ}\text{C}$ at the time of admission was defined as fever. Blood tests were performed to determine the white blood cell count (upper limit of normal $>10 \times 10^3 \mu\text{L}$) and the level of C-reactive protein (CRP) (upper limit of normal $>0.5 \text{ mg/dL}$). All patients underwent abdominal ultrasonography and oral and intravenous tomography. Patients were categorized according to the Hinchey classification by evaluating their radiological imaging features (Fig. 1).^[2,6]

The conservative and surgical treatment status of the patients was determined. Patients who were not operated and underwent drainage catheterization were evaluated under conservative treatment. By examining the medical records of the discharged patients and taking the information by telephone, we questioned whether the symptoms of diverticulitis recurred after discharge or whether the patient had an operation later.

Statistical Analysis

Data obtained in this study were evaluated using the SPSS 20.0 package software (IBM, Chicago). The frequency and percentage distributions of the data are presented. Differences between the groups were assessed by normality tests,

and the Mann–Whitney U test was used for variables not normally distributed. The chi-squared analysis was used to examine the correlations between the groups of nominal variables. Fisher's exact test was used when the expected values in the tables did not have a sufficient volume, and Pearson's chi-squared analysis was applied using the Monte Carlo simulation in cross-classified RxC tables. A significance level of 0.05 was used, indicating that there was a significant dependence between the groups when $p<0.05$, and no significant dependence between the groups when $p>0.05$.

RESULTS

Twenty-two patients with RCD were included in the study. Nine (40.9%) were female, 13 (59%) were male, and the female-to-male (f/m) ratio was 0.69. The age range was 26–84 years, and the mean age of the patients was 50.9 years. The duration of the symptom prior to hospitalization was 1–5 days, with a mean of 2.36 days. In general, 59% of the patients had fever, 54.5% had nausea, 36.3% had diarrhea, 54.5% had pain in the right lower abdomen, and 45.4% had generalized abdominal pain at the time of admission. Leukocytosis was detected in 77.2% of all patients. High CRP levels were found in all patients (100%).

Abdominal tomography was performed in all patients after oral, rectal, and intravenous contrast administration. Based on the localization, 59% of the patients had diverticulitis in the right colon, and 41% of them had diverticulitis in the cecum. The grade and stage of the acute diverticulitis were determined based on the findings of abdominal tomography. Accordingly, 68.1% of patients with localized pericolic abscess or phlegmon with a diameter $<5 \text{ cm}$ were classified as the Hinchey Stage I, and 31.8% of patients with pelvic, intra-abdominal, retroperitoneal abscess, $>5 \text{ cm}$ in diameter, but limited, were evaluated as the Hinchey Stage II diverticulitis. The Hinchey Stage I diverticulitis was detected mostly in the right colon (66.7%), and the Hinchey Stage II diverticulitis (57.1%) in the cecum (Fig. 2).

When the age of the patients with RCD was compared according to the Hinchey stages, the mean age of the patients with the Hinchey Stage II was higher (63.57 years), and this was statistically significant ($p<0.05$). The female-to-male ratio of the patients with RCD was 0.69, but the gender status

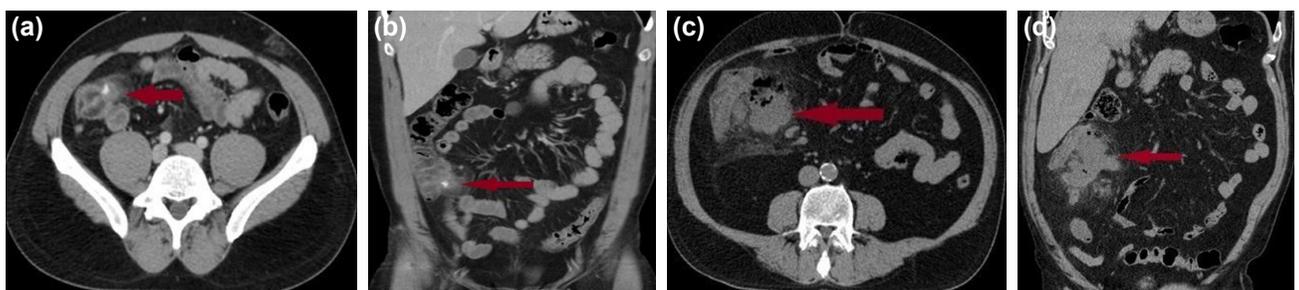


Figure 1. Hinchey Stage I (a and b) – II (c and d) Right colon diverticulitis on tomography.

Table 1. Demographic and clinical characteristics of patients with right colon diverticulitis

Parameters	Hinchey Stage I			Hinchey Stage II			Results	
	n	%	Mean	n	%	Mean	Value	p
Age (years)	15	–	45.7	7	–	63.57	2.507	0.012*
Gender								
Male	10	66.7	–	3	42.9	–	1.068	0.376*
Female	5	33.3	–	4	57.1	–		
Fever (>38.2 °C)								
Yes	7	46.7	–	6	85.7	–	2.874	0.165*
No	8	53.3	–	1	14.3	–		
Nausea								
Yes	6	40	–	6	85.7	–	3.840	0.074*
No	9	60	–	1	14.3	–		
Diarrhea								
Yes	3	20	–	5	71.4	–	5.207	0.052*
No	12	80	–	2	28.6	–		
Bottom right								
Abdominal pain								
Yes	11	73.3	–	1	14.3	–	6.407	0.020*
No	4	26.7	–	6	85.7	–		
Generalized pain								
Yes	4	26.7	–	6	85.7	–	6.407	0.020*
No	11	73.3	–	1	14.3	–		
Pain duration (day)	15	–	1.87	7	–	3.43	2.271	0.023*
Leucocyte count (µL)	15	–	12040	7	–	17401	2.152	0.031*
CRP (mg/dL)	15	–	4.76	7	–	14.68	2.153	0.031*

*Mann Whitney–U Test. †Fisher's Exact Test. CRP: C-reactive protein.

was not statistically significantly correlated with the Hinchey stages. In general, 59% of the patients had fever (>38.2°C), 54.5% had nausea, and 36.3% had diarrhea, but these were not statistically significantly correlated with the Hinchey stages. A total of 73.3% of the right lower abdominal pain in the RCD patients was seen in the Hinchey Stage I patients, and this was statistically significant ($p<0.05$). On the other hand, 85.7% of the generalized abdominal pain was seen in the Hinchey Stage II patients, and this was statistically significant ($p<0.05$). Duration of pain was higher in the Hinchey Stage II patients (average 3.43 days), and this was statistically significant ($p<0.05$). Leukocyte and CRP levels were statistically significant in the Hinchey Stage II patients (mean leukocytes, 17,401 µL; CRP 14.68 mg/dL) ($p<0.05$) (Table 1).

Appendectomy was performed in 2 patients (9%) as a treatment. Preoperative radiological examinations of these patients were diagnosed as acute appendicitis. One of them was the Hinchey Stage I, and the other was Stage II cecum diverticulitis during the operation. Another patient (4.5%) had a complex abscess with the Hinchey Stage II cecum di-

verticulitis. Right hemicolectomy and primary anastomosis were performed. This patient was discharged with healing after 8 days with no mortality and morbidity in the postoperative period.

Symptomatic conservative treatment was applied in other 19 patients (86.3%). Conservative treatment was applied in 14 Hinchey Stage I RCD patients and 5 Hinchey Stage II RCD patients. Oral intake in these patients was discontinued for 2–3 days, intravenous hydration therapy with balanced solutions was given, intravenous dual antibiotherapy was applied, including antibiotics such as third-generation cephalosporins and metronidazole, and after 2–8 days (mean, 3.7 days), they were discharged by oral antibiotics.

A percutaneous drainage catheter was placed under sonography in 4 patients (18.1%) in who the localized abscess did not regress with conservative treatment. Percutaneous abscess drainage was applied in 2 Hinchey Stage I patients and 2 Hinchey Stage II patients. Patients with a drainage catheter were discharged after 4–5 days of treatment, followed by oral

Table 2. Treatment and recurrence status of patients with right colon diverticulitis

Parameters	Hinchey Stage I		Hinchey Stage II		Results	
	n	%	n	%	Value	p
Treatment						
Conservative	14	93.3	5	71.4	1.856	0.227*
Surgery	1	6.7	2	28.6		
Percutaneous drainage						
Yes	2	13.3	2	28.6	0.711	0.565*
No	13	86.7	5	74.1		
Recurrences						
Yes	2	13.3	2	28.6	0.711	0.565*
No	13	86.7	5	74.1		

antibiotics. After treatment of all patients, appropriate physical activity, probiotics, and high-fiber diet of herbal origin were recommended to all patients, and they were followed up (Table 2).

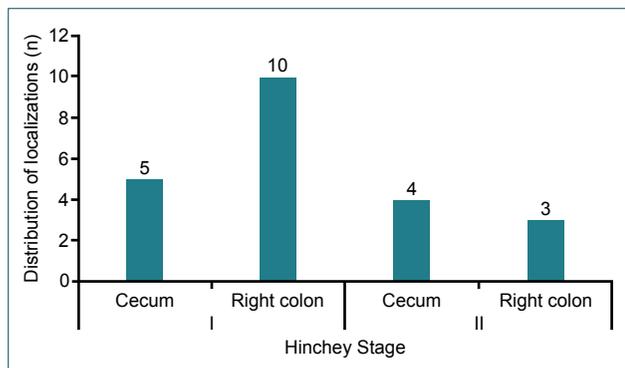


Figure 2. Hinchey Stages of right colon diverticulitis and distribution of localization.

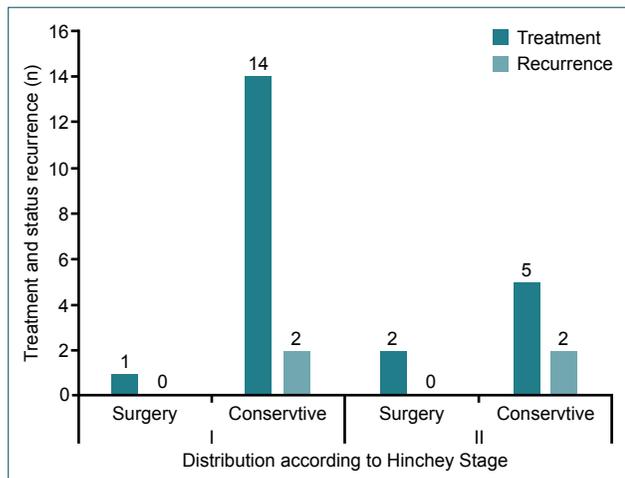


Figure 3. Prognosis status of patients with right colon diverticulitis.

After 2 years of follow-up, no recurrence was detected in patients undergoing surgery. Two Hinchey Stage I patients with conservative treatment and 2 Hinchey Stage II patients developed recurrence. The recurrence status according to the Hinchey stages was not statistically significant. Since recurrence attacks were not complicated, the patients were treated conservatively again, followed by a high-fiber dietary recommendation (Fig. 3).

DISCUSSION

The pathophysiology of CDD is very complex and is related to colonic motility disorders, chronic inflammation in the colon wall, and microflora imbalance.^[1,2,6] In the etiology, factors such as genetics, lineage, reduced fiber intake, obesity, lack of physical activity, muscle diseases, etc. were found to be related to CDD.^[6,7] CCD has two forms. Congenital diverticulum is a true diverticulum containing all layers of the column. Acquired diverticulum is a false diverticulum consisting of only colon mucosa.^[1-3] Right colon diverticula are usually solitary and true diverticula; muscle hypertrophy is not observed.^[7,8]

In Western societies, 95% of CDD cases are found in the sigmoid and left colon, 1%–2% in the right colon, and 6%–10% in the whole colon.^[3,6] Approximately, 20% of the cases of CDD occur in the Eastern societies, 70% of which are in the right colon, and 10%–15% are in the left colon.^[6-8] This difference is thought to be due to environmental factors, life diversity, and genetics.^[2,7,8]

The most important CDD complication is acute colonic diverticulitis, observed in 10%–25% of the cases.^[1,2] The pathogenesis of diverticulitis occurs in the form of pressure increase, inflammation, focal necrosis, and micro and macro perforation in diverticula.^[2,6] In 25% of the cases, complicated diverticulitis may occur, and intra-abdominal abscess, perforation, fistula, or obstruction may develop. The mortality rate may range between 12%–36%.^[1,3,6] 41% of CCD cases requiring emergency hospitalization are colon diverticulitis, and 20% of them are operated.^[9]

Strategies for treatment and follow-up have been developed by staging colon diverticulitis.^[10,11] The most commonly used of them is the Hinchey staging, which was developed in 1978 and then modified.^[6,11] Currently, new staging methods are continued to be developed.^[12] We used the Hinchey staging in the present study.

In our research, patients with right-sided diverticulitis constituted 14.4% of CDD. This was an expected rate for our country, which is located between the Eastern and Western worlds. In our study, 68.1% of the patients were evaluated as the Hinchey Stage I, and 31.8% of them as the Hinchey Stage II diverticulitis.

In a study, the mean age of patients with RCD was 41.9, and 78.4% of them were male. Patients with RCD usually had localized peritonitis.^[13] The morbidity rate was 14.2%, and the mortality rate was zero.^[13] In the present study, the female-to-male ratio of the patients with RCD was 0.69, and the mean age was 50.9 years. The mean age of the Hinchey Stage II patients was 63.57 years, and this was statistically significant.

Especially the RCD located in the cecum mostly mimics acute appendicitis.^[4,5,13] Studies have shown that RCD was found in 2.7% of the patients who underwent laparotomy with a diagnosis of acute appendicitis.^[14] In laparotomies for appendectomy, the main pathology was RCD in 1 out of 300 appendicitis cases.^[15] Research suggests that appendectomy should be performed to accurately follow-up diverticulitis in such a case.^[5,11] In the present study, there were 2 patients undergoing appendectomy for acute appendicitis, but they were diagnosed with cecal diverticulitis.

Pain occurring in 93%–100% of the patients with RCD begins directly in the lower-right quadrant and lasts a long time; in advanced cases, pain becomes generalized.^[13] To a lesser extent, there are also nausea and vomiting.^[15,16] In the present study, right lower abdominal pain was found in 73.3% of the Hinchey Stage I patients, and this was statistically significant. The generalized abdominal pain was seen in 85.7% of the Hinchey Stage II patients, and this was statistically significant. Pain duration was longer in the Hinchey Stage II patients (average, 3.43 days), and this was statistically significant.

Leukocytosis is found in 58% of the patients with RCD.^[4,5] Studies have shown that the leukocyte count and fever are not valuable in distinguishing complicated and non-complicated diverticulitis.^[17] On the other hand, it has been reported that CRP can be used as an indicator for the presence of complications. In addition, CRP is a useful tool in predicting the clinical severity of acute diverticulitis.^[17,18] However, the presence of a low CRP complex does not mean that the disease can be excluded safely.^[17,18] In the present study, the leukocyte and CRP levels were higher in the Hinchey Stage II patients and were statistically significant.

A radiologic examination is the primary diagnostic method for colon diverticulitis.^[11,17] Radiologically, water-soluble contrast-enema radiography, abdominal sonography, contrast-enhanced tomography, and magnetic resonance imaging (MRI) are used.^[5,6] In the studies, sonography had the sensitivity of 77%–98% and specificity of 80%–99%; MRI had the sensitivity of 86%–94% and specificity of 88%–92%.^[20] Although sonography and MRI detect some complications of acute diverticulitis and occasionally show differential diagnoses, they are not as sensitive as contrast-enhanced tomography for these indications.^[4,10,19] Contrast-enhanced tomography has the sensitivity and specificity of 99% in right-sided

diverticulitis.^[5,11,19] In the present study, all patients underwent abdominal sonography and contrast-enhanced abdominal CT.

The Hinchey Stage I patients with uncomplicated diverticulitis and isolated paracolic abscesses <5 cm in size on a radiological evaluation without clinical peritonitis findings can be treated conservatively with antibiotics and intestinal resting.^[5,21–23] If the patient's clinical condition does not improve, the colon resection and primary anastomosis can be planned.^[24,25] If RCD is solitary, only diverticulectomy can be performed because it causes less complication.^[3,5]

The Hinchey Stage II patients have a pericolic, pelvic, and retroperitoneal limited abscess, but if the abscess is <5 cm, and the patient's general condition is good, they may recover with conservative medical treatment.^[9,21] Otherwise, colon resection is performed with primary anastomosis.^[9,21] In 14% of patients with complicated Hinchey Stage II colon diverticulitis, coloileal, colovaginal, and colorectal fistulas may be found, and additional surgical procedures may be required.^[11,20] Laparoscopic surgery can be performed safely and effectively in the Hinchey Stage I and II RCD patients.^[22,23]

The Hinchey Grade III colon diverticulitis is associated with purulent peritonitis, has a mortality rate of 15%–35%, and a morbidity rate of 70%–80%. Segmental colectomy with laparotomy is recommended as emergency surgery in these patients.^[11,20,26] Modified Hinchey Stage IV colonic diverticulitis has fecal peritonitis, and its mortality rate is 6 times higher than of purulent peritonitis.^[9,27] These patients should have an emergent open laparotomy, peritoneal lavage, segmental colectomy, and stoma.^[11,26,27]

Percutaneous drainage appears to be an optimal first-line treatment of Stage I and II colonic diverticulitis with an abscess diameter ≥ 5 cm.^[11] This option results in a lower morbidity and mortality compared to emergency surgery and up to 74% success rates.^[11,24] Percutaneous drainage allows for stabilization of the patient, stage regression, and the performance of definitive surgical procedures under elective conditions.^[9,24] Colonoscopy control is recommended to exclude the neoplasm at least 6 weeks after an acute diverticulitis attack.^[3,11]

In other studies, 10-year recurrence rates after conservative treatment of non-complicated RCD patients, which make 75% of RCD cases, is approximately 20%–30%.^[22,23] In complicated patients, which account for 25% of RCD cases, a recurrence rate in the 10-year follow-up after surgical treatment is 2%–10%.^[6,9,22]

In the present study, 19 (86.3%) patients were treated conservatively, and 4 (18.1%) patients underwent percutaneous drainage catheterization. Of the 19 patients treated conservatively, only 4 patients (21%) developed RCD and were treated symptomatically.

Conclusion

Conservative treatment methods should be preferred, especially if there is non-complicated RCD. Surgical treatment should generally be used in patients unresponsive to conservative treatment, and in the treatment of complicated and recurrent cases. The authors declare that they have no conflicts of interest. All authors have read and approved the final version of the manuscript.

Conflict of interest: None declared.

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ORIJİNAL ÇALIŞMA - ÖZET

Sağ kolon divertikülitinde konservatif yaklaşımın etkinliği

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AMAÇ: Kolon divertikül hastalarının yaklaşık %10–25'i hayatları boyunca kolon divertiküli ile karşılaşmaktadırlar. Batı ülkelerinde sağ taraflı divertiküler hastalık nadir görülen bir durum iken, Asya ülkeleri arasında yaygındır. Bu çalışmanın amacı, sağ kolon divertiküli saptanılan hastalarımızın klinik ve tedavi sonuçlarını değerlendirmektir.

GEREÇ VE YÖNTEM: 2011 ve 2015 yılları arasında çekum ve sağ kolon divertiküli tanısıyla tedavi edilen 22 hastanın demografik ve klinik verileri analiz edildi. Radyolojik inceleme ve klinik bulgulara göre hastalara Hinchey Evrelemesi yapıldı. Daha sonra Hinchey Evrelemesine göre hastaların demografik ve klinik özelliklerinin oransal olarak değerlerine ve istatistiksel olarak anlamlılığına bakıldı.

BULGULAR: Araştırmamıza sağ kolon divertiküli tanısı konulan 22 hasta alındı. Kadın/erkek oranı 0.69 idi. Karın tomografisi ile yapılan değerlendirme sonrasında hastaların %68.1'i Hinchey evre I, %31.8'i Hinchey evre II divertiküli saptandı. Çoğunlukla Hinchey Evre I divertiküli sağ kolonda (%66.7) ve Hinchey Evre II divertiküli çekumda (%57.1) bulundu. Hinchey Evre II hastalarının ortalama yaşı daha yüksekti (ortalama, 63.6 yıl) ve istatistiksel olarak anlamlıydı ($p<0.05$). İki hastada apendektomi ve bir hastada sağ hemikolektomi yapılmıştı. Diğer 19 hastaya konservatif tedavi uygulandı. Ortalama hastanede yatış süresi 3.4 gündü. İki yıllık takipte konservatif tedavi alan dört hastada nüks görüldü; cerrahi tedavi alan hastalarda nüks görülmedi.

TARTIŞMA: Sağ kolon divertiküli genellikle doğu toplumlarında 50 yaş altı erkeklerde ve soliter olarak görülmektedir. Tedavi seçeneği olarak özellikle komplike olmayan olgularda konservatif yöntemler tercih edilmelidir. Cerrahi tedavi ise genellikle nüks ve komplike olguların tedavisinde kullanılmalıdır.

Anahtar sözcükler: Hinchey Evrelemesi; konservatif tedavi; sağ kolon divertiküli.

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