



Identifying patients with complicated diverticulitis, is it that complicated?

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ABSTRACT

Objective: Discriminating simple from complicated diverticulitis solely on clinical bases is challenging. The aim of this study was to identify clinical predictive factor for the need for invasive treatment for patients presenting with acute diverticulitis in the emergency room.

Material and Methods: The records of all patients, who were discharged from a university hospital between January 2010 and March 2018 with "diverticulitis" diagnosis, were reviewed. Data collected included clinical features, whether this was a first or recurrent episode, WBC, and Hinchey score. Patients were divided into conservative and invasive treatment groups. Groups were compared by age, sex, BMI, fever, WBC and CT findings. Hinchey score groups were also compared by age, sex, BMI, fever, WBC.

Results: A total of 809 patients were included. Mean age was 60.6 years, with 10% below 40 years. Most patients were treated conservatively (95.9%) while only 4.1% were treated invasively. WBC at presentation was significantly higher in those who required invasive treatment in comparison with the conservative group (13.72 vs. 11.46K/uL, $p=0.024$). A statistically significant higher WBC was found among patients with a higher Hinchey score (13.16 vs 11.69, $p<0.005$). No difference between the groups was found in terms of age, sex, fever or BMI.

Conclusion: This study showed that patients who present with acute diverticulitis and an elevated WBC are prone to a more severe disease and a higher Hinchey score. Prudence should be taken with these patients, and CT scan is warranted as there is a greater chance that invasive treatment will be required.

Keywords: Diverticulitis, invasive treatment, Hinchey score

INTRODUCTION

Diverticulitis, or inflammation of the diverticulum due to micro-perforation (1), is a major health concern in the western world (2). This disease may either follow a benign or a complicated course. One of the major classification systems for acute diverticulitis is the Hinchey classification and its modifications which are solely based on imaging (3,4).

Treatment strategies of diverticulitis are usually based on clinical and laboratory findings in addition to the CT findings, which is considered the gold standard for the diagnosis of diverticulitis (5).

Despite the growing prevalence of diverticulitis, its diagnosis and treatment remain open to debate (6). It is worth noting that recent evidence-based studies are heading towards conservative treatment and many previous strategies, including dietary restriction and bed rest, are now obsolete (7). Although most uncomplicated cases of diverticulitis resolve with conservative treatment (Stages 0-II), larger abscesses or failure of conservative treatment might require percutaneous drainage or surgery (8).

The aim of this study was to identify clinical predictive factors that help discern complicated diverticulitis patients who may require invasive treatment in the emergency room.

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MATERIAL and METHODS

This retrospective study was approved by the ethics committee of the hospital (0058-18-KMC) on 26.06.2018 before the study was started and was conducted in accordance with the principles set forth in the Helsinki Declaration. The records of all patients who had a discharge diagnosis containing "diverticulitis from hospitalization with a" between the years 01.2010 and 03.2018 at a university hospital were reviewed. Patients with diverticulitis of the colon were included in the study. Incomplete records, age <18 and pregnant women were excluded from the study. The following data were collected: socio-demographic characteristics including age, sex, body mass index (BMI) and co-morbidities. Obesity was defined as BMI >25 kg/m². Data collection also included length of current illness, pain location, fever (defined as $\geq 37.5^{\circ}\text{C}$), whether this was a first or recurrent episode, and elective surgery for recurrent disease. Laboratory values were reviewed for white blood count [WBC (normal range 4500-11000)]. Computed tomography findings including disease location and Hinchey score were collected. Patients who presented with diverticulitis and phlegmon only were classified as Hinchey 0. Hinchey score was defined on admission. Treatment was classified as conservative in case of antibiotics only therapy (conservative group), and invasive in case of percutaneous drainage or surgical intervention (invasive group). Groups were compared by age, sex, BMI, fever, WBC and CT findings. Hinchey score groups were also compared by age, sex, BMI, fever, WBC.

Statistical Analysis

Sample size was calculated using bidirectional equivalence study model, based on the minimal age difference between the two study groups. Student's t test, as well as the non-parametric Mann-Whitney U test, was used in order to compare quantitative variables between two independent groups. The non-parametric Kruskal-Wallis test was used to compare more than two independent groups. In order to assess the association between categorical variables, Chi-square and Fisher's exact tests were used. All tests applied were two-tailed, and a p-value of 5% or less was considered statistically significant.

RESULTS

A total of 1350 of the patient records met the inclusion criteria, of which, 358 were duplicate records. One-hundred and eighty-three records were excluded for incorrect diagnosis. A total of 809 patients were included in the study. Characteristics of the cohort are listed in Table 1. Mean age was 60.6 years, with 10.4% (n= 82) below 40 years, and male/female ratio was 58/42%. Most patients (n= 439, 71.3%) were obese, and 28.1% of the cohort had a BMI ≥ 30 kg/m². Most patients presented with a first diverticulitis episode (n= 619, 76.5%). Most (62.9%) patients had localized abdominal tenderness, and had no fever (80.7%), with

a mean WBC of 11.2 K/uL. Computed tomography was performed in 83.2% (n= 673) of the patients. Most patients presented with Hinchey 0, and only 9.1% presented with Hinchey I - IV. A higher rate (95.2% vs. 4.8%) of patients was treated conservatively, but this did not reach statistical significance. No difference was found between invasive and conservative treatment among patient with left or right-side diverticulitis (Table 2).

No statistically significant difference was found between the two groups in terms of age, sex, diabetes, BMI or fever (Table 3). Thirty-five patients had an invasive procedure, of which 13 patients who presented with Hinchey 0 upon admission who had disease progression. Of the patients who underwent invasive treatment, 63% (n= 22) had a laparotomy with resection (either Hartmann's procedure for left side diverticulitis (n= 20) or ileocecectomy with primary anastomosis for right side diverticulitis due to free perforation (n= 2), 26% (n= 9) had a laparoscopy with either drainage or lavage, and the rest (11%, n= 4) had percutaneous CT guided drainage (Table 1). Of the patients who were operated on, 16% were operated for inaccessible abscess for percutaneous drainage, 11% due to failure of conservative treatment and 19.5% of the patients were operated due to either generalized peritonitis or septic shock.

There was a trend towards invasive treatment among patients with recurrent diverticular disease vs primary episode (6.3% vs. 3.4%, p= 0.078). Patients in the invasive group had a high WBC at presentation compared to the conservative group (13.72 vs. 11.46 K/uL, p= 0.024, Table 3). A statistically significant higher rate of patients with Hinchey scores of I-IV had an invasive procedure compared to patients with Hinchey score of 0 (Table 2). A higher rate of patients with Hinchey score of II-IV had an invasive procedure compared to patients with a score of I (70 vs 28%, p< 0.001, Table 2). A statistically significant higher WBC was found among patients with a higher Hinchey score II-IV vs. score 0 (15.41 vs 11.68, p< 0.005, Table 4). Multivariate analysis showed that Hinchey score was associated with invasive treatment. Elevated WBC on admission showed a trend toward invasive treatment, Table 5.

There was no statistically significant difference between age, sex, BMI subgroups in terms of Hinchey score, treatment, recurrence or elective surgery.

DISCUSSION

Clinical diagnosis of diverticulitis remains challenging, with false diagnosis made in 40-60% of the cases (9,10). In this study, 183 records (18.5%) were excluded for incorrect diagnosis. Due to the retrospective nature of this study, data regarding actual diagnosis was unavailable. This study showed that the most common symptom in patients with diverticulitis was left lower quadrant pain with no significant additional symptoms. However, pain, whether generalized or localized, is not specific for the

Table 1. Cohort’s characteristics

Characteristic	Numbers	Percentage
Sex		
Male	340	42
Female	469	58
Age		
>40	727	89.6
≤40	82	10.4
Diabetes		
Yes	143	17.7
No	666	82.3
BMI*		
≥25 kg/m ²	439	71.3
<24.9 kg/m ²	177	28.7
Episode time		
First episode	619	76.5
Recurrent episode	190	23.5
Abdominal pain		
Localized	509	62.9
Generalized	300	37.1
Fever		
≥37.5°C	156	19.3
<37.5°C	653	80.7
Abdominal CT scan		
Did	673	83.2
Didn't	136	16.8
Treatment		
Conservative	774	95.7
Invasive	35	4.3
Type of invasive treatment		
Hartmann’s procedure	20	57
Ileocectomy	2	6
Laparoscopic drainage or lavage	9	26
CT guided drainage	4	11
Elective Surgery		
Yes	27	3.3
No	782	96.7

* Data available for only 616 patients; BMI: Body mass index.
CT: Computed tomography.

diagnosis of diverticulitis. Additional clinical factors are required to correctly diagnose acute diverticulitis; Andeweg et al. have found that elevated C-reactive protein (CRP) may be associated with correct clinical diagnosis of acute diverticulitis (9). Other studies have found temperature to be of little clinical importance in this patient population (11), Our findings are in concordance with these results.

As the diagnosis of diverticulitis is challenging when based solely on clinical basis, distinguishing simple from complicated

diverticulitis is even more challenging. Van de Wall et al. have shown that body temperature had little value in discriminating complicated from simple diverticulitis, and thus imaging is of paramount importance (12).

This study evaluated the role of several clinical factors in predicting the severity of diverticulitis and found a strong association between elevated WBC count and a more severe disease with a consequent need for invasive treatment.

Table 2. Computed tomography findings

CT findings	Conservative	Invasive	Total	p
Location				
Left & Sigmoid colon	565 (95%)	31 (5%)	596	1
Right colon	74 (96%)	3 (4%)	77	
Total	639 (95%)	34 (5%)	673*	
Hinchey				
0	615	13 [‡]	628	<0.001
I	18	7	25	
II	6	9	15	
III	0	4	4	
IV	0	1	1	
Hinchey I vs II-IV				
I	18 (72%)	7 (28%)	25	<0.001
II-IV	6 (30%)	14 (70%)	20	

CT: Computed tomography.

* A total of 673 underwent abdominal CT scan of the entire cohort.

‡ One patient was operated without undergoing a CT scan.

Table 3. Comparison of conservative and invasive treatment

Risk factor	Conservative	Invasive	p
Age (mean, years)	60.75	60.91	0.953
Sex (m/f)	325/451	15/18	0.684
WBC (K/uL)	11.76	13.72	0.024
BMI (kg/m ²)	27.62	27.9	0.787
Diabetes (yes/total ratio)	17.5%	21%	0.587
Abdominal Tenderness (localized/generalized)	491/285	18/15	0.309
Fever ≥ 37.5°C	19%	30%	0.1
Recurrent episode (yes/total ratio)	23%	36%	0.078

WBC: Wight blood cell count, BMI: Body mass index.

Table 4. Correlation of Hinchey score and WBC

Hinchey score	Number	WBC	p
0	628	11.68	<0.05
I	25	11.72	
II	15	16.15	
III	4	10.82	
IV	1	13.9	
0	628	11.68	0.005
II-IV	20	15.41	

WBC: Wight blood cell count.

This study also found that 70% of the patients who had Hinchey scores between II-IV were treated invasively while only 28% of those with Hinchey I required invasive treatment. These find-

ings are congruous with a study performed by Bates et al, which demonstrated that 80.3% of patients with Hinchey Ia were treated conservatively (13).

Table 5. Correlation of Hinchey score and WBC on admission with invasive treatment

	Odds Ratio	95% Confidence Interval	P
Hinchey score I	14.03	5.58-35.27	<0.001
Hinchey score II-IV	43.5	10.95-172.78	<0.001
WBC on admission	1.07	0.99-1.45	0.077

WBC: Wight blood cell count.

A strong correlation between Hinchey score and WBC levels was found in our study, and similar findings have been reported by van de Wall et al. (12). All of these findings constitute a cornerstone in helping physicians stratify patients who should be further evaluated, preferably by a CT scan, and in turn help them choose the most appropriate treatment.

It is worth mentioning that patients who are younger than 40 years of age constituted 10.1% of the cohort, which means that health professionals should not dismiss this as a potential diagnosis in this age group, taking into consideration that the youngest patient who was treated invasively was 24 years old. On the other hand, the elderly are more prone to misdiagnosis compared to the young, which can be interpreted by the fact that elder patients are more likely to have comorbidities and altered signs and symptoms (11). which in turn necessitates greater clinical attentiveness when evaluating them.

Previous studies showed that younger patients are more prone to complicated or recurrent diverticulitis and thus a more aggressive treatment should be guaranteed. Recently, several studies, as well as our study, have proven that this logic is out-of-date. A study following conservatively-treated diverticulitis cases younger than 50 years of age has demonstrated that during the course of 5-9 years of follow ups, none of them needed colostomies and one third only needed a subsequent surgery (7,14).

Limitations of the Study

The retrospective nature of this study is its major limitation. As a retrospective study, not all parameters were available in patients' records and hence not collected and analyzed. Laboratory test were not uniform across patients' records, especially pivotal parameters as CRP levels.

CONCLUSION

Identifying patients with complicated diverticulitis based on clinical findings solely is challenging. The results of this study suggest that patients with acute diverticulitis and an elevated WBC are more likely to have a severe disease and a higher Hinchey score, but the final decision should be based on a variety of clinical factors, not a single one. Prudence should be taken with these patients, and CT scan is warranted as there is a greater chance that invasive treatment will be required. This diagnosis should not be overlooked even among young patients.

Ethics Committee Approval: This study was approved by the Ethics Committee of the hospital (0058-18-KMC) in 26.06.2018 before the study was started and has been conducted in accordance with the principles set forth in the Helsinki Declaration.

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ORJİNAL ÇALIŞMA-ÖZET

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Komplike divertikülitli hastaların belirlenmesi gerçekten zor mu?

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ÖZET

Giriş ve Amaç: Basit ve komplike divertikül ayırımını sadece klinik bulgulara dayanarak yapmak zorludur. Bu çalışmanın amacı, acil service akut divertikül ile başvuran hastalarda invazif tedavi ihtiyacını öngörücü faktörleri belirlemektir.

Gereç ve Yöntem: Ocak 2010 ile Mart 2018 tarihleri arasında bir üniversite hastanesinden "divertikül" tanısı ile taburcu olan tüm hastaların verileri incelendi. Toplanan verilere klinik özellikler, bunun ilk mi tekrarlayan bir epizot mu olup olmadığı, BKH ve Hinchey skoru dahil edildi. Hastalar konservatif ve invazif tedavi grupları olarak ikiye ayrıldı. Gruplar, yaş, cinsiyet, VKİ, BKH, ateş ve BT bulguları yönünden karşılaştırıldı. Hinchey skor grupları da ayrıca yaş, cinsiyet, VKİ, ateş ve BKH yönünden karşılaştırıldı.

Bulgular: Çalışmaya toplamda 809 hasta alındı. Ortalama yaş 60,6 yıl iken bunun %10'unun 40 yaş altı hastalar oluşturuyordu. Hastaların çoğunluğu konservatif olarak tedavi edilirken (%95,9) sadece %4,1'inde invazif tedaviye ihtiyaç duyuldu. Konservatif tedavi grubuna kıyasla invazif tedavi grubunda hastaneye başvuru esnasındaki BKH anlamlı olarak daha yüksek bulundu (13,72 vs. 11,46 K/uL, p= 0,024). Hinchey skoru daha yüksek olan hastalarda anlamlı derecede yüksek BKH bulundu (13,16 vs. 11,69, p< 0,005). Yaş, cinsiyet, ateş ve VKİ açısından gruplar arası bir fark saptanmadı.

Sonuç: Bu çalışmada, akut divertikül ve yükselmiş BKH ile başvuran hastalarda daha ciddi hastalık ve daha yüksek Hinchey skoru olduğu bulundu. Bu hastalarda ihtiyatli olmakta fayda varken invazif tedavi daha yüksek oranda gerekli olacağı için BT ile görüntülemeye başvurulması da gerekmektedir.

Anahtar Kelimeler: Divertikülit, invazif tedavi, Hinchey skoru

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