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Predictive Factors for Colonic Diverticular Rebleeding: A Retrospective Analysis of the Clinical and Colonoscopic Features of 111 Patients

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Background/Aims: Colonic diverticular bleeding can stop spontaneously or be stopped by endoscopic hemostasis. We analyzed the clinical and colonoscopic features of patients with colonic diverticular bleeding to establish the predictive factors for rebleeding. **Methods:** A total of 111 patients (median age, 72 years) with colonic diverticular bleeding in Aso Iizuka Hospital between April 2007 and July 2010 were enrolled. Age, sex, body mass index (BMI), comorbidity, medication, location of bleeding, colonoscopic findings and hemostatic methods were analyzed retrospectively from the hospital records. **Results:** The most common sites of bleeding were the ascending (39.6%) and sigmoid (29.7%) colon. Overt rebleeding occurred in 30 patients (27.0%). Spontaneous hemostasis was seen in 81 patients (73.0%), and endoscopic hemostatic treatment was performed in 30 patients. The BMI in the patients with colonic diverticular rebleeding was significantly higher than in patients without rebleeding. Colonoscopic findings of actively bleeding or nonbleeding visible vessels in the responsible diverticula were more frequent in the group with rebleeding. **Conclusions:** A higher BMI and colonoscopic findings of actively bleeding or nonbleeding visible vessels can be used as predictive factors for colonic diverticular rebleeding. Patients with such findings should be carefully followed up after hemostasis of the initial colonic diverticular bleeding. **(Gut Liver 2012;6:334-338)**

Key Words: Colonic diverticular bleeding; Predictive factors; Rebleeding; Retrospective analysis; Body mass index

INTRODUCTION

Colonic diverticulosis has become common in Japan as a result of the aging population and westernization of eating habits, and the number of patients with colonic diverticular bleeding will increase accordingly.[1] Previous studies have demonstrated the risks of colonic diverticular bleeding.[2-6] Both nonsteroidal anti-inflammatory drugs (NSAIDs) and low-dose aspirin (LDA) have already been proven to be risk factors for acute lower gastrointestinal bleeding, including acute diverticular bleeding.[2-5] Recently, several potential risk factors for diverticular bleeding have been analyzed in Japanese patients. First, in addition to NSAIDs, arterial hypertension has been shown to be an independent risk factor for colonic diverticular bleeding.[2] Second, high body mass index (BMI) is significantly associated with increased risk of colonic diverticular bleeding.[6]

It is difficult to identify the location of colonic diverticula with active bleeding because it often results in self-limited bleeding. Endoscopic hemostasis, such as epinephrine injection,[7,8] multipolar or heat probe coagulation,[7,9] endoclip placement,[10] and band ligation,[11,12] can be applied as initial treatment once the bleeding site is successfully identified. The problem is the cases with repeated colonic diverticular bleeding even if active overt bleeding seems to be controlled well. Endoscopic hemostatic treatment is not satisfactory for patients who need transcatheter arterial embolization (TAE) or surgery.[13] Predictive factors for diverticular rebleeding, however, have yet to be clarified. We, therefore, analyzed retrospectively the clinical and endoscopic features of 111 cases with colonic diverticular bleeding, to determine whether any clinical or colonoscopic findings are associated with rebleeding.

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MATERIALS AND METHODS

1. Patients

One hundred and eleven patients, who were diagnosed with colonic diverticular bleeding by colonoscopy and treated in Aso Iizuka Hospital between April 2007 and July 2010 (period of observation, 180 to 1,340 days; median, 756 days), were enrolled in this study. Diagnosis of colonic diverticular bleeding was made based on the criteria reported by Jensen *et al*.[7] These criteria included all of the followings: observation of blood clots in the colon, presence of diverticulum, absence of blood in the terminal ileum, and no other demonstrable cause of bleeding. This study was reviewed and approved by the ethical committee of Aso Iizuka Hospital.

2. Data collection

We retrospectively collected data on age, sex, BMI, hemoglobin (Hb) level on admission, and colonoscopic findings. The medical records were also reviewed to obtain information on comorbidity and current medication. Considerable emphasis was put on concomitant diseases such as hypertension, diabetes mellitus, hyperlipidemia, ischemic heart disease and cerebrovascular disease. In addition, outcome, length of hospital stay, and fasting period were compared.

3. Colonoscopy and hemostatic treatment strategy

Colonoscopy was performed after colon preparation by using polyethylene-glycol-containing lavage solution. Urgent colonoscopy was defined as colonoscopy performed at the bedside within 12 hours after hospitalization. Hemostatic treatment was carried out as follows. First of all, when the site of colonic diverticular bleeding was recognized, endoscopic hemostatic treatment was performed by injection of hypertonic saline-epinephrine (HSE) solution around the diverticulum. We usually made a marking with endoclips near the bleeding point before starting HSE injection, to avoid losing it before completing endoscopic hemostatic treatment. After bleeding was lessened or stopped by HSE injection, endoclips were placed at the bleeding point depending on the endoscopist's judgment. Secondly, when overt colonic diverticular bleeding recurred after initial endoscopic hemostatic treatment, hemostasis was attempted repeatedly. Thirdly, when a further trial of endoscopic hemostasis failed, TAE was performed to obtain hemostasis. Fourthly, the surgical colectomy was considered after the failure of hemostasis with TAE.

4. Statistical analysis

The data were evaluated using descriptive statistical methods (range, mean±SD). Wilcoxon or chi-square test was used to determine statistical significance between two groups using JMP

Table 1. Clinical Features and Characteristics of 111 Patients

Variable	No. of patients	Variable	No. of patients
Sex		Emergency endoscopy	59 (53.2)
Female	47 (42.3)	Identification of bleeding colonic diverticulum	33 (29.7)
Male	64 (57.7)	Stigmata of hemorrhage (AB:NBVV:DAC)	22:2:9
Age, yr		Identification of bleeding colonic location	87 (78.4)
Median	72	Location of bleeding colonic diverticulum	
Range	35-92	Cecum	2 (1.8)
Mean BMI	23.8±3.1	Ascending colon	44 (39.6)
Mean Hb level on admission	9.1±2.3	Transverse colon	6 (5.4)
Comorbidities		Descending colon	1 (0.9)
Hypertension	77 (69.4)	Sigmoid colon	33 (29.7)
Diabetes mellitus	28 (25.2)	Unknown	25 (22.5)
Hyperlipidemia	25 (22.5)	Final hemostatic methods	
Ischemic heart disease	19 (17.1)	Observation	81 (73.0)
Cerebrovascular disease	19 (17.1)	Endoscopic hemostasis	30 (27.0)
Oral medication		TAE	5 (4.5)
NSAIDs	18 (16.2)	Surgery	1 (0.9)
Steroid	2 (1.8)	Mean length of hospital stay, day	8.9±5.4
Anticoagulants	13 (11.7)	Mean length of fasting period, day	2.8±2.8
Antiplatelets	42 (37.8)	Early-phase rebleeding (<1 mo)	18 (16.2)
Antihypertensive	70 (63.1)	Late-phase rebleeding (≥1 mo)	18 (16.2)

Data are presented as mean±SD or number (%).
BMI, body mass index; Hb, hemoglobin; NSAIDs, nonsteroidal anti-inflammatory drugs; AB, active bleeding; NBVV, nonbleeding visible vessels; DAC, densely adherent clot; TAE, transcatheter arterial embolization.

Statistical Discovery Software version 8.0 (SAS Institute, Cary, NC, USA), with $p<0.05$ considered to be significant.

RESULTS

1. Clinical features and characteristics of patients with colonic diverticular bleeding

The clinical features and characteristics of 111 patients with colonic diverticular bleeding are shown in Table 1. The median age of patients was 72 years (range, 35 to 92) and there were 47 (42.3%) women and 64 (57.7%) men. The mean BMI was 23.8 and mean Hb level on admission was 9.1±2.3 g/dL (range, 5.2 to 16.0). Regarding comorbidity, 77 patients (69.4%) had hypertension, 28 (25.2%) diabetes mellitus, 25 (22.5%) hyperlipidemia, 19 (17.1%) ischemic heart disease, and 19 (17.1%) cerebrovascular disease. Also, 18 patients (16.2%) took NSAIDs, 2 (1.8%) steroids, 13 (11.7%) anticoagulants, 42 (37.8%) antiplatelets, and 70 (63.1%) antihypertensives.

Fifty-nine (53.2%) patients were examined by urgent colonoscopy and others by nonurgent colonoscopy. The definite source of bleeding was identified in only 33 (29.7%) patients by observing bleeding vessels, nonbleeding vessels in the diverticulum, or adherent clots in the diverticulum. Notably, the number of patients (33) with definite diagnosis of colonic diverticular bleeding is much smaller than the total number (111). This can be explained by that the diagnostic criteria for colonic diverticular bleeding by Jensen have the risk to include nonidentified colonic bleeding other than diverticular bleeding, such as nonidentified colonic angiodysplasia, Dieulafoy's lesions or small ulcers. Out of 33 patients, 18 and 15 patients were examined by urgent and nonurgent colonoscopy, respectively. Colonic diverticular bleeding occurred in the cecum (2 patients, 1.8%), ascending colon (44 patients, 39.6%), transverse colon (6 patients, 5.4%), descending colon (1 patient, 0.9%), sigmoid colon (33 patients, 29.7%) and unknown region (25 patients, 22.5%). No hemostatic treatment was performed in 81 patients (73.0%) because these patients had spontaneous hemostasis. Endoscopic hemostatic treatment was performed in 30 patients (27.0%). Three out of these 30 patients were transported to our hospital after receiving endoscopic hemostatic treatment in a previous hospital.

Rebleeding occurred in 30 (27.0%) out of 111 patients. Rebleeding within 1 month after initial bleeding (early-phase) was seen in 18 patients (16.2%) and rebleeding occurring >1 month after initial bleeding (late-phase) was observed in 18 patients (16.2%). Namely, both early- and late-phase rebleeding occurred in 6 patients. On the other hand, repeated rebleeding occurred in 13 out of 30 patients with rebleeding, including 6 patients with both early- and late-phase rebleeding. These patients were treated by following our hemostatic treatment strategy described in the method. Among them, endoscopic hemostasis was achieved in 8 patients (7.2%), but not in 5 patients (4.5%), who were required to undergo TAE. One patient (0.9%) was required to undergo surgical colectomy because hemostasis was not successful, even by TAE. The mean length of hospital stay and the mean fasting duration were 8.9±5.4 days and 2.8±2.8 days, respectively, and no deaths occurred.

2. Clinical features and colonoscopic findings of patients with rebleeding

To establish predictive factors for rebleeding, we compared the clinical features or colonoscopic findings of two groups of patients with and without rebleeding (Table 2). Sex ratio and age were not significantly different between the two groups. The BMI score (25.1±3.8) of patients with rebleeding was significantly higher than that (23.3±3.7) of patients without rebleeding ($p<0.05$). There were no significant differences in comorbidity between the two groups. Furthermore, oral medication such as NSAIDs, anticoagulants and antiplatelets was not associated with rebleeding. Importantly, the rate of active bleeding and nonbleeding visible vessels was significantly higher in the group

Table 2. Comparison of the Clinical Features between Patients with and without Rebleeding

Variable	With rebleeding (n=30)	Without rebleeding (n=81)	p-value
Male sex	19 (66.7)	45 (55.6)	0.28
Age, yr			
Median	68.5	71.5	0.14
Range	47-89	35-92	
Mean BMI	25.1±3.8	23.3±3.7	<0.05
Comorbidities			
Hypertension	21 (70.0)	61 (75.3)	0.81
Diabetes mellitus	9 (30.0)	22 (27.2)	0.81
Hyperlipidemia	7 (23.3)	19 (23.5)	1.00
Ischemic heart disease	4 (13.3)	15 (18.5)	0.78
Cerebrovascular disease	4 (13.3)	15 (18.5)	0.78
Oral medication			
NSAIDs	5 (16.7)	13 (16.0)	1.00
Steroid	1 (3.3)	1 (1.2)	0.47
Anticoagulants	2 (11.8)	11 (13.6)	0.51
Antiplatelets	8 (26.7)	34 (42.0)	0.19
Antihypertensive	18 (60.0)	52 (64.2)	0.83
AB+NBVV	16 (53.3)	8 (9.9)	<0.0001
DAC	1 (3.3)	8 (9.9)	0.44
Endoscopic hemostasis	14 (46.7)	16 (19.8)	<0.01
Identification of bleeding colonic diverticulum	17 (66.7)	16 (19.8)	<0.001
Patients requiring TAE	5 (16.7)	0 (0.0)	<0.001

Data are presented as mean±SD or number (%).
BMI, body mass index; NSAIDs, nonsteroidal anti-inflammatory drugs; AB, actively bleeding; NBVV, nonbleeding visible vessel; DAC, densely adherent clot; TAE, transcatheter arterial embolization.

Table 3. Characteristics of Five Patients Requiring Transcatheter Arterial Embolization

Characteristic	Patients				
	1	2	3	4	5
Sex	M	M	M	M	F
Age, yr	76	74	75	72	83
BMI	29.6	24.4	24.2	25.0	21.6
Hb level on admission	7.0	6.8	7.4	7.8	7.6
Bleeding site	A	S	A	A	A
Length of hospital stay, day	9	5	15	13	14
Fasting period, day	4	4	3	2	4
Oral medication					
NSAIDs	-	-	+	-	-
Antiplatelets	-	-	+	-	-
Comorbidities	HT, DM	HT	HT, DM, HL, IHD	HT, DM	-

M, male; F, female; BMI, body mass index; Hb, hemoglobin; A, ascending; S, sigmoid; NSAIDs, nonsteroidal anti-inflammatory drugs; HT, hypertension; DM, diabetes mellitus; HL, hyperlipidemia; IHD, ischemic heart disease.

with rebleeding. Accordingly, the rate of receiving endoscopic hemostatic treatment and identification of bleeding diverticula by initial colonoscopy was significantly higher in patients with rebleeding. The rate of observing densely adherent clots did not differ between the two groups. Five patients required TAE treatment; all of whom were in the rebleeding group. The rate of requiring TAE was significantly higher in the group with rebleeding than in that without (Table 2). Patients who underwent TAE were characterized by severe anemia (<8.0 g/dL, 100%), male predominance (80%), old age (>70 years, 100%), high BMI (>24, 80%), and bleeding in the ascending colon (80%) (Table 3).

DISCUSSION

Colonic diverticular bleeding is thought to be the result of rupture of an arteriosclerotic diverticular vessel.[14,15] Colonic diverticular bleeding often results in self-limited bleeding, otherwise endoscopic hemostatic treatment is necessary. One problem is that we sometimes encounter cases with repeated colonic diverticular bleeding even if active bleeding has been controlled by endoscopic hemostasis, or spontaneously. Repeated colonic diverticular bleeding potentially leads to a life-threatening condition. It has already been shown that patients with arteriosclerotic diseases, taking NSAIDs or LDA,[2] and high BMI,[6] have significantly higher risks of initial colonic diverticular bleeding than their respective controls. However, little is known about the risk or predictive factors for repeated colonic diverticular bleeding. The main objectives of the present study, therefore, were to elucidate whether any clinical or colonoscopic findings were associated with rebleeding. Among the risk factors for initial diverticular bleeding listed above, we found that BMI of patients with rebleeding was significantly higher than that of those without rebleeding, indicating that BMI can be used as a predictive factor for colonic diverticular rebleeding. Alternatively, arteriosclerotic diseases, and use of NSAIDs or aspirin, were not associated with rebleeding in our cases, although these factors were associated with initial colonic diverticular bleeding. One of the possible reasons why we did not see an increased risk of rebleeding in NSAIDs/LDA users was that the use of NSAIDs or aspirin was assessed at the time of admission for initial bleeding. In some patients, use of such drugs was stopped after initial bleeding. Another possible reason was that the scale of the present study was not large enough to get to the conclusion, thus causing type II error.

Observation of active bleeding or nonbleeding visible vessels in the colonic diverticula was associated with increased risks of rebleeding. Diverticula with such colonoscopic findings are usually considered to be an indication for endoscopic hemostasis. The rate of endoscopic hemostasis was, therefore, significantly higher in the group with rebleeding than those without. Responsible colonic diverticula are identified by observation of lesions with active bleeding, nonbleeding visible vessels, and densely adherent clots. The rate of identifying responsible lesions was significantly higher in the group with rebleeding than that without, because more cases with active bleeding/nonbleeding visible vessels were included in the former. As initial hemostasis was achieved in all the patients who underwent endoscopic hemostasis, and TAE was performed only for the patients with rebleeding, the rate of TAE was higher in the rebleeding group. Taken together, increased risks of rebleeding were not associated with the endoscopic hemostasis procedure itself, but with the nature of the hemorrhagic colonic diverticular lesions, which caused sustained active bleeding or continued visibility of responsible vessels. Endoclips are difficult to place directly on the responsible vessels in the diverticula in most cases, and are alternatively placed close to diverticula, therefore, such a procedure may not be effective for prevention of recurrent bleeding. Fragility of the blood vessels themselves, which causes

sustained active bleeding, or vessels remaining visible seems to determine the course of hemorrhagic colonic diverticular disease and whether it causes recurrent bleeding.

In conclusion, we showed that BMI is a possible predictive factor for colonic diverticular rebleeding. In addition, colonoscopic findings of active bleeding or visible vessels in responsible diverticula were associated with an increased risk of rebleeding. Therefore, patients with high BMI and high risk of colonoscopic findings should be followed up very carefully.

CONFLICTS OF INTEREST

No potential conflict of interest relevant to this article was reported.

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