Spontaneous Perforation of Sigmoid Colon Due to Chronic Constipation

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ABSTRACT

Background/Aim: Spontaneous perforation of the sigmoid colon is defined as a sudden perforation of the normal colon in the absence of diseases. However, its etiology remains unclear.

Methods: Between January 2010 and December 2017, twenty-three patients who underwent Hartmann's operative procedure with colostomy for acute peritonitis due to sudden perforation of the sigmoid colon at our hospital were enrolled in this study. Patients were divided into two groups according to the cause of the perforation (i.e., spontaneous perforation in seven and diverticulosis in sixteen).

Results: All patients had a long history of chronic constipation. The mean age of the spontaneous group was 79.0 (71-87) years, which was significantly older than that of the diverticulosis group. Significant differences in gender, complication rates, or nutritional factors, such as body mass index, serum total protein, albumin, and cholinesterase, were not identified between the two groups. Although the lymphocyte counts of the spontaneous group were significantly lower than those of the diverticulosis group ($p=0.029$), significant differences were not identified in the neutrophil-to-lymphocyte ratio between the two groups. The diameters of the perforations in the spontaneous group were significantly larger than that of the diverticulosis group ($p=0.046$).

Conclusion: Spontaneous perforation of the sigmoid colon due to chronic constipation may not be due to undernutrition but instead due to immune depression.

Key words: Spontaneous perforation, constipation, sigmoid colon, surgery

INTRODUCTION

Spontaneous perforation of the colon is defined as a sudden perforation of the normal colon without diseases, such as tumors, diverticulosis or external injury (1). The disease has often been seen in patients having a long history of chronic constipation. The solid feculent mass compresses the colonic wall, diminishes the blood supply and leads to ischemia and necrosis of the colonic mucosa, which can cause marked changes in feculent ulcer formation. Ulcers may lead to colonic rupture in some cases (2-5). However, the etiology of colonic

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rupture remains unclear. The aim of this study is to examine the etiology of spontaneous perforation of the sigmoid colon.

PATIENTS AND METHODS

The Ethics Committee for Biomedical Research of the Jikei Institutional Review Board approved the protocol [30-221 (9242)], and all patients or their family members provided their written informed consent to participation.

Between January 2010 and December 2017, twenty-three patients (ten males and thirteen females) who underwent Hartmann's operative procedure with colostomy for acute peritonitis due to sudden perforation of the sigmoid colon at our hospital were enrolled in this study. Patients were divided into two groups according to the cause of the perforation, which was spontaneous in seven patients and diverticulosis in sixteen patients. All patients had a long history of chronic constipation. Body weight and hematological/biochemical parameters were investigated to assess the nutritional status of the patients. The hematological/biochemical parameters included levels of total protein, albumin, Cholinesterase (ChE), and the lymphocyte count, which were measured before surgery. Body mass index (BMI) was calculated using the standard formula: weight (kg)/height (m²).

Statistical analysis

Continuous variables are expressed as the means and ranges. The Wilcoxon rank-sum test was used to

compare the continuous variables, and the chi-square test was used to compare the categorical data. A p-value of less than 0.05 was used to indicate significance. All data were analyzed using the Statistical Package for Social Sciences (SPSS) 24.0, (IBM SPSS, Tokyo, Japan).

RESULTS

The mean age of the spontaneous group was 79.0 (71-87) years, which was significantly older than that of the diverticulosis group. Significant differences in gender, complication rates, and nutritional factors, such as body mass index, serum total protein, albumin, and cholinesterase, were not identified between the two groups. Although the lymphocyte counts of the spontaneous group were significantly lower than those of the diverticulosis group ($p=0.029$), significant differences were not identified in the neutrophil-to-lymphocyte ratio between the two groups. The diameters of the perforations of the spontaneous group were significantly larger than those of the diverticulosis group ($p=0.046$). The average length of stay in the postoperative intensive care unit (ICU) was significantly longer for the spontaneous group than for the diverticulosis group ($p=0.022$) (table 1).

DISCUSSION

Generally, colonic perforation is most often caused by feces. Maurer et al.(3) proposed the diagnostic criteria for feculent colonic perforation: (1) The perforation is a

Table 1 - Clinicopathological features of the patients

Characteristic	Spontaneous (n=7)	Diverticulosis (n=16)	p value
Mean age (range), years	79.0 (71 - 87)	70.6 (44 - 85)	0.042
Gender, n (%)			0.867
Male	3 (43)	7 (44)	
Female	4 (57)	9 (56)	
Complication, n (%)			0.740
Heart disease	0 (0)	1 (6)	
Lung disease	0 (0)	1 (6)	
Renal disease	0 (0)	1 (6)	
Other	0 (0)	1 (6)	
Body mass index, mean (range) kg/m ²	21.2 (18.1 - 23.0)	21.9 (18.8 - 26.1)	0.579
Total protein, mean (range) g/dl	5.2 (3.2 - 6.7)	5.2 (3.8 - 6.5)	0.725
Albumin, mean (range) g/dl	2.8 (1.6 - 3.9)	2.6 (1.4 - 3.5)	0.907
Cholinesterase, mean (range) U/l	163.4 (70.0 - 306.0)	156.2 (38.0 - 262.0)	0.640
Lymphocyte count, mean (range) /ml	560.4 (221.0 - 1,292.0)	1,509.5 (200.0 - 8,160.0)	0.029
NLR, mean (range)	8.5 (3.2 - 21.3)	9.8 (1.9 - 23.3)	0.668
Diameter of perforation, mean (range) mm	12.1 (10.0 - 15.0)	3.8 (0.0 - 5.0)	0.046
Postoperative ICU stay, mean (range) days	5.3 (2.0 - 17.0)	1.7 (1.0 - 2.0)	0.022

NLR: Neutrophil-to- lymphocyte ratio; ICU: Intensive care unit

rounded shape, more than 1 cm in diameter; (2) The colon is full of stool, which diffuses into the abdominal cavity through the perforation; (3) Ischemia and necrosis of the colonic mucosa leads to a feculent ulcer and an acute inflammatory reaction surrounding the perforation site that can be seen in microscopical examination; and (4) External injury or other diseases, such as obstruction, tumors and diverticulosis, must be excluded. In this study, after pathological examination, seven patients in the spontaneous group satisfied the above criteria.

The most frequent location of perforation is opposite the mesenteric edge of the sigmoid colon and the recto-sigmoid colon (3). This phenomenon may be due to the special physiological and anatomical features of the sigmoid colon. There is no ramus anastomoticus between the lowest branch of the sigmoid arteries and the superior rectal artery, which causes physiological ischemia. When stiff stool goes through the sigmoid colon, the colonic wall is compressed, which obstructs the blood supply. The blood supply to the opposite side of the mesentery is poor. The stool is more likely to stay in the rectosigmoid colon because of the narrowed colonic cavity. In addition, the smooth muscle contracts, which leads to an increase in pressure within the colonic cavity (6-9).

Spontaneous colonic perforation is more frequent in the elderly, and the mean age of onset is greater than 60. Approximately 61 to 81% of patients had a history of constipation (2,4). In this study, the mean age of the spontaneous group was 79.0 (71-87), which was significantly older than that of the diverticulosis group, and all patients had a long history of chronic constipation.

The possibility of this disease should be taken into consideration in elderly patients who have chronic constipation and are bed-ridden for long periods of time (10). In these patients, nutritional factors, such as body mass index, serum total protein, albumin, and cholinesterase, are often found to be low; however, no significant difference in nutritional factors was identified between the spontaneous group and the diverticulosis group in this study. We addressed the relationship between neutrophil-to-lymphocyte ratio (NLR) and perforation. The NLR is derived from the counts of circulating neutrophils and lymphocytes. It accurately represents the underlying inflammatory process (11). High NLR value was significantly associated with severe cholecystitis or appendicitis (12,13). However, no significant difference in NLR value was identified between the spontaneous group and the

diverticulosis group in this study.

Because the lymphocyte counts of the spontaneous group were significantly lower than those of the diverticulosis group, immune depression may be strongly associated with spontaneous perforation. However, a large-scale prospective or retrospective study is needed to clarify this issue.

CONCLUSION

In conclusion, spontaneous perforation of the sigmoid colon due to chronic constipation may not be due to undernutrition but instead due to immune depression.

Conflict of Interest Statement

The authors declare that there are no conflicts of interest regarding this study.

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