

## Therapeutic barium enema for bleeding colonic diverticula: Four case series and review of the literature

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### INTRODUCTION

Diverticular hemorrhage is a common cause of lower gastrointestinal bleeding<sup>[1-3]</sup>. Most colonic diverticula are asymptomatic and remain uncomplicated. However, it was reported that severe diverticular hemorrhage occurs in 3%-5% of patients with diverticula<sup>[4,5]</sup>. Most cases of diverticular bleeding resolve themselves. However, massive bleeding of diverticula often requires endoscopic or angiographic therapy. As in some cases, the source of bleeding cannot be identified or multiple sites of bleeding are found, endoscopic or angiographic treatment is not so effective for bleeding. Although surgical treatment has been performed for persistent bleeding, the patients are often elderly and, therefore, at a high risk for surgery.

Most of the reported series of therapeutic barium enema are from Western countries. However, the prevalence of diverticular diseases of the colon, including severe and persistent bleeding in the Eastern countries, has increased in the last decades. We present herein four patients with severe and persistent bleeding due to colonic diverticular disease that were treated with high concentration barium enemas, and have reviewed the literature pertinent to this procedure.

### CASE SERIES

#### Case 1

A 63-year-old man was hospitalized for a several-day history of painless passage of bright red blood per rectum. He had hypertension and diabetes mellitus, and had been taking medication for hypertension for ten years. He had no history of receiving non-steroidal anti-inflammatory drugs, low-dose aspirin, and anticoagulants. His past history revealed two bleeding episodes from colonic diverticula that resolved on their own. Physical examination revealed no abdominal tenderness. Laboratory tests showed severe anemia.

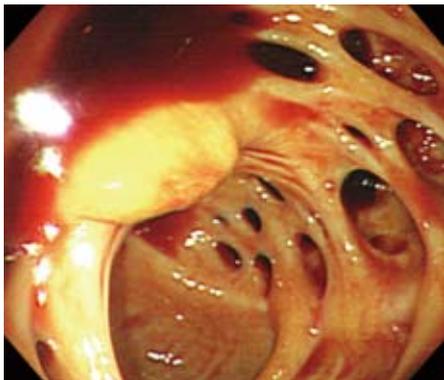
### Abstract

The prevalence of diverticular diseases of the colon, including severe and persistent bleeding in Eastern countries, has increased in the last decades. The bleeding from colonic diverticula is the most common cause of acute lower gastrointestinal bleeding. Herein, we report four cases of severe and persistent bleeding of colonic diverticular disease that could be treated with a high concentration barium enema. These four cases showed a similar pattern of bleeding whose source could not be identified. Colonoscopy revealed fresh blood in the entire colon and many diverticula were noted throughout the colon. No active bleeding source was identified, but large adherent clots in some diverticula were noted. After endoscopic and angiographic therapies failed, therapeutic barium enema stopped the severe bleeding. These patients remained free of re-bleeding in the follow-up period (range 17-35 mo) after the therapy. We report the four case series of therapeutic barium enema and reviewed the literature pertinent to this procedure.

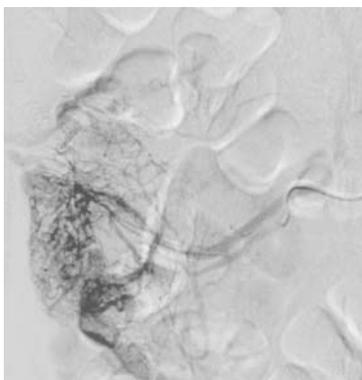
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**Key words:** Therapeutic barium enema; Colonic diverticula; Diverticular bleeding

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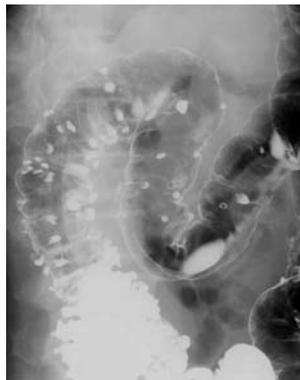


**Figure 1** Endoscopic appearance of bleeding diverticula with adherent clots in the ascending colon.



**Figure 2** Superior mesenteric arteriogram showing hypervascularity in the ascending colon.

Colonoscopy revealed fresh blood in the entire colon and many diverticula with adherent clots were noted throughout the colon (Figure 1). No active bleeding source was identified; but large adherent clots in some diverticula were noted. Endoscopic placement of metallic clips was done for some diverticula with large adherent clots suspicious of being a bleeding source. On the next day, the patient had severe hematochezia again and required additional transfusion of 4 units of packed red cells. Scintigraphic examination failed to identify the bleeding site. Emergency angiography was performed. Although superior mesenteric arteriography could not reveal any extravasation, hypervascularity was noted on the right side of the colon (Figure 2). Vasopressin infusion was administered; but the patient continued to bleed, and required 4 units of blood. We discussed the situation with the patient and his family, and explained the subsequent treatment modalities, including surgical treatment or optional therapeutic barium enema. After obtaining informed consent, we performed therapeutic barium enema. Barium (concentration: 200%, volume: about 400 mL) including 50 000 units of thrombin was administered per rectum, and the leading edge of the contrast medium was followed up to the ascending colon by fluoroscopy. The enema tip was withdrawn one hour after confirming that the diverticula in the ascending colon were filled with barium (Figure 3). On the next day, we confirmed that multiple diverticula were filled



**Figure 3** X-ray revealing diverticula in the ascending colon filled with barium.

with barium by abdominal X-ray examination. Ten days after the therapy, we also confirmed that the multiple diverticula at the right side of the colon were filled with barium. The patient was discharged without any further bleeding or complications, and surgical treatment was avoided. The patient remained free of re-bleeding more than 3 years after the therapy.

### Case 2

A-67-year old man with diverticula, noted on prior screening colonoscopy, was transferred to our hospital with sudden painless massive rectal bleeding. While in hospital, he developed painless hematochezia and severe anemia requiring transfusion of 2 units of packed red cells. He had hypertension, and had been taking medication for hypertension for five years. He had a history of receiving non-steroidal anti-inflammatory drugs for lumbago. Colonoscopy revealed fresh blood in the entire colon and many diverticula throughout the colon. Endoscopic placement of metallic clips was done for some diverticula suspicious of being a bleeding source. Two days later, the patient had severe hematochezia again and required additional transfusion of 2 units of packed red cells. Emergency angiography could not reveal any extravasation. Therapeutic barium enema was performed and the patient remained free of re-bleeding two years after the therapy.

### Case 3

A-76-year old man visited the Emergency Department for a three-day history of diarrhea and painless hematochezia. He had hypertension and had been taking medication for hypertension. Colonoscopy revealed fresh blood throughout the colon and many diverticula in the ascending and sigmoid colon. Endoscopic placement of metallic clips was done for some diverticula suspicious of being a bleeding source. Three days later, the patient began bleeding again, and required transfusion of 2 units of packed red cells. The patient and his family wished to avoid intervention, and agreed to the therapeutic barium enema. Active bleeding was stopped after the therapeutic barium enema. He remained free of re-bleeding 20 mo after the therapy.

### Case 4

A-63-year old man was hospitalized for a two-day history

**Table 1** Cases undergoing therapeutic barium enema for diverticular hemorrhage

Case	1	2	3	4
Gender	M	M	M	M
Age (yr)	63	67	76	63
Associated diseases	HT,DM	HT	HT	None
NSAID, L-Asp, Anticoagulants	None	NSAID	None	None
Previous bleeding episodes ( <i>n</i> )	2	2	1	1
Location	Throughout the colon	Throughout the colon	Ascending sigmoid	Ascending
Appearance	AC, FB	FB	FB	AC
Hemorrhagic site	NI	NI	NI	NI
Follow-up period (mo)	35	23	20	17
Recurrent bleeding	None	None	None	None

NI: Not identified; AC: Adherent clot; FB: Fresh blood; HT: Hypertension; DM: Diabetes mellitus; NSAID: Nonsteroidal anti-inflammatory drug; L-Asp: Low-dose aspirin.

of painless passage of bright red blood per rectum. Colonoscopy revealed fresh blood in the entire colon and many diverticula with adherent clots in the ascending colon. Endoscopic placement of metallic clips was done for some diverticula suspicious of being a bleeding source. During the following hospitalization days, the patient experienced 3 further episodes of bleeding and received 3 units of packed red cells. The patient wished to avoid intervention and agreed to receive therapeutic barium enema. There was no evidence of re-bleeding 17 mo after the therapy.

## DISCUSSION

The prevalence of diverticular diseases of the colon in the Eastern countries has increased in the last decades, and the increasing prevalence reflects changes in the life-style and eating habits. A previous study on 6849 patients undergoing barium enema examination during an 8-year period (from 1985 to 1992) revealed an increase in the frequency from 10.7% in 1985 to 17.8% in 1992<sup>[6]</sup>. Another study concluded that diverticular diseases of the right colon have increased steadily in Japan, suggesting that diverticulitis and bleeding may continue to increase<sup>[7]</sup>. As many reports stated, the prevalence of colonic diverticula and their related severe bleeding have increased recently in the Eastern countries including Japan<sup>[6-8]</sup>.

Colonic diverticula are usually asymptomatic. However, in some cases, acute and chronic inflammation, hemorrhage, and perforation develop as complications of this disease. Bleeding from colonic diverticula is the most common cause of acute lower gastrointestinal bleeding<sup>[1-3]</sup>. It was reported that acute lower intestinal bleeding occurs in up to 3%-5% of colonic diverticula<sup>[4,5]</sup>. Most cases of diverticular bleeding resolve themselves and diverticular bleeding stops spontaneously in 70%-80% of cases<sup>[9]</sup>. However, some patients require evaluation by colonoscopy and angiography, or surgical treatment to stop their bleeding. There are some case reports on various techniques of treatment with colonoscopy for diverticular bleeding including heater probes, epinephrine injection therapy, argon plasma coagulation, and endo-clip application<sup>[10-16]</sup>. Endoscopic treatment can be useful when a source of lower gastrointestinal bleeding

is identified. However, when the source of bleeding cannot be identified or multiple sites of bleeding are found, endoscopic treatment is not effective for stopping bleeding. The specific location of bleeding points is very important for therapeutic colonoscopy of bleeding diverticula. Intermittent diverticular hemorrhage can also lead to incomplete endoscopic therapy.

Angiography is recognized as an accurate diagnostic modality for detecting the site of active gastrointestinal bleeding. Mesenteric angiography is indicated when the flow is estimated to be greater than 0.5-1 mL/min, and offers a potential for selective vasopressin infusion or arterial embolization if the bleeding site is identified<sup>[16]</sup>. However, angiography frequently fails to reveal the source of gastrointestinal hemorrhage. In addition, in patients with multiple sites of bleeding or intermittent and quiescent bleeding, it is difficult to treat diverticular hemorrhage by angiographic intervention. Furthermore, angiography is an invasive modality with complications such as arterial dissection and occlusion, bowel infarction, myocardial infarction with vasopressin infusion, and renal failure due to contrast medium<sup>[1,17]</sup>.

In our four cases, colonoscopy demonstrated large amounts of fresh blood throughout the colon and many diverticula with adherent blood clots; but it was difficult to identify the active bleeding site, and the specific bleeding points. Endoscopic and angiographic therapies failed to identify the bleeding points, and could not stop bleeding. As an optional therapy, therapeutic barium enema was performed for severe bleeding to avoid surgical treatment. Table 1 summarizes the four cases of persistent and severe diverticular bleeding in whom the active bleeding sites could not be identified and therapeutic barium enema was effective and no re-bleeding was detected. Each case had one or two persistent bleeding episodes previously and underwent repeated endoscopic treatment. However, these patients remained well and had no re-bleeding after barium enema treatment for 17-35 mo. In all cases, the concentration of barium was 200%, the volume was 400 mL, and the enema tip was withdrawn one hour after the therapy (Table 1). In our four cases, although no severe complications of therapeutic barium enema (such as perforation) occurred, we have to take into account the

Table 2 Previous reports on therapeutic barium enema for diverticular hemorrhage

Author, year	n	Location	Concentration of barium	Successful cases	Recurrent bleeding
Adams <i>et al</i> 1970	28	NR	NR (20%) <sup>1</sup>	26	9
Chorost <i>et al</i> 2000	1	TO	20%	1	0
Koperna <i>et al</i> 2001	63	NR	NR	53	10
Matsuhashi <i>et al</i> 2003	1	AC, TC, SC	200% (with 1 mg of epinephrine)	1	0
Our cases 2008	4	TO AC, SC (2 cases) AC	200%	4	0

<sup>1</sup>Mentioned in the discussion section. TO: Throughout the colon; AC: Ascending colon; NR: Not reported; SC: Sigmoid colon; TC: Transverse colon.

possibility of perforation in patients with diverticulitis.

Some case reports and clinical studies of therapeutic barium enema for diverticular hemorrhage have been reported (Table 2)<sup>[8,18-20]</sup>. A previous case report<sup>[8]</sup> presented successful treatment with a high concentration of barium with 1 mg of epinephrine. In that case, epinephrine was added to the solution for vasoconstriction; but the possible adverse effects of epinephrine such as sudden hypertension were not ruled out. Another case report<sup>[18]</sup> presented successful treatment with a 20% barium sulphate solution at a height of 0.9 m for 5 min. In 1970, Adams *et al*<sup>[19]</sup> demonstrated that 26 of 28 acute bleeding episodes were arrested by therapeutic barium enema with a 20% concentration of barium. That study also stated that the only single complication was laceration of the rectal mucosa by the enema tube<sup>[19]</sup>. A previous clinical study<sup>[20]</sup> evaluated the efficacy of barium enema therapy for severe diverticular bleeding and concluded that therapeutic barium enema is the treatment of choice for the first bleeding episode, while surgical resection should be performed if re-bleeding occurs. In that report, the failure rate of conservative treatment and therapeutic barium enema with consequent re-bleeding was 43.4% and 15.9%, respectively<sup>[20]</sup>. Furthermore, an investigation suggested that complications develop more often in patients after colonic resection than in those after barium enema therapy, and that the mortality after surgery is significantly higher than that following therapeutic barium enema<sup>[20]</sup>.

Most of the reported cases of therapeutic barium enema were from the Western countries. However, the prevalence of diverticular diseases of the colon in the Eastern countries including Japan has increased recently. From our present experiences, therapeutic barium enema is also effective for right side diverticula which are typically located in the Eastern countries.

It is difficult to clarify the mechanism underlying the effect of therapeutic barium enema. Adams *et al*<sup>[19]</sup> mentioned two potential factors, namely the pressure by the barium solution producing tamponade of the bleeding vessel, and the direct hemostatic action by the barium sulfate. The effect of barium on bleeding in the gastrointestinal tract is also described in a previous

report<sup>[21]</sup>. That report mentioned that tap-water enema is better, as it contains no anticoagulants, and is more effective in producing clot formation than most barium suspensions.

A clinical study on surgery for complicated colonic diverticula concluded that in patients with multiple bleeding sites or severe ongoing hemorrhage from a source that cannot be localized despite endoscopic and angiographic assessment, subtotal or total colectomy may be imperative<sup>[22]</sup>. However, in view of the mortality of surgical therapy, optional and non-invasive therapies such as therapeutic barium enema are needed in the cases that require colonic resection.

In conclusion, the prevalence of diverticular diseases of the colon has increased in the last decades not only in the Western countries, but also in the Eastern countries. Barium enema therapy is effective for diverticular hemorrhage when the active bleeding site could not be identified by colonoscopy. When no other therapeutic techniques are available, barium enema therapy may be useful as an optional therapy which may avoid surgical therapy. As far as we know, there are few reports on randomized trials of treatment of colonic diverticular bleeding. Because of the limited number of clinical case series, further randomized controlled trials of treatment are required to clarify the role of therapeutic barium enema in bleeding diverticula.

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