

Report

**A Case of Massive Bleeding from Jejunal Diverticula Diagnosed Preoperatively
Using Capsule Endoscopy****Hironari SHINDO^{1,2}, Eiichiro NOGUCHI^{1,2,*}, Kaori TAKEMOTO^{1,2},
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A 76-year-old woman presented with dizziness and melena at the internal medicine department. She was admitted for emergency surgery after being diagnosed with preshock due to gastrointestinal bleeding with a serum hemoglobin level of 5.6 g/dl and systolic blood pressure of 90 mmHg. Capsule endoscopy (CE) was performed when the source of bleeding could not be determined by upper or lower endoscopy or contrast-enhanced computed tomography. CE revealed an apparent diverticulum in the upper jejunum along with adherent clots and dark red/black contents in the small intestine. These findings confirmed the upper jejunum as the source of bleeding. Although the bleeding was brought under control using conservative measures, double-balloon endoscopy (DBE) was conducted for further investigation. A giant diverticulum was visualized in the upper jejunum. In addition, a number of neighboring diverticula were found in a concurrent small bowel series. With a diagnosis of giant jejunal diverticulosis, a laparoscopy-assisted small bowel resection (diverticulectomy) was carried out under general anesthesia using the single-incision laproscopic surgery method. Joint use of CE and DBE was useful for the diagnosis given the rarity of diverticular bleeding from the jejunum. This preoperatively diagnosed case is presented along with a literature review.

Key Words: jejunal diverticula, hemorrhagic preshock, capsule endoscopy, double-balloon endoscopy**Introduction**

Although diverticulosis of the small intestine is occasionally detected on X-rays or during surgery, it is a rare disease and is generally asymptomatic. Besides duodenal diverticula and Meckel's diverticula, diverticula in the jejunum and ileum occur rarely and are difficult to differentially diagnose from gastrointestinal bleeding. Bleeding from a diverticulum often presents as a fresh rectal hemorrhage. This can confuse the clinician because bleeding from the colon is far more common than bleeding from jejunal diverticula. This case is being reported as an example of jejunal diverticulum with massive bleeding in which the joint use of capsule endoscopy (CE) and double-balloon endoscopy (DBE) was effective for the preoperative diagnosis

of gastrointestinal bleeding.

Case Report**Patient:** 76-year-old female.**Complaints:** Dizziness and melena.**Past history:** Paroxysmal atrial fibrillation (taking aspirin orally for treatment) and hypertension.**Family history:** Nothing relevant noted.**History of present illness:** The patient noticed melena three days prior to being examined. She sought outpatient treatment when dizziness became pronounced on the morning prior to the examination.**Condition at examination:** Blood pressure was 93/58 mmHg and pulse was 123 beats/min. Signs of anemia were evident including pallor of the complexion and conjunctiva. The abdomen was soft and

Table 1 Laboratory data on admission.

Hematological examination		Blood chemistry	
WBC	9,300 /ul	TP	5.5 g/dl
RBC	191 × 10 ⁴ /ul	Alb	2.6 g/dl
Hb	5.6 g/dl	T-Bil	0.2 mg/dl
Hct	17.1 %	AST	13 IU/l
PLT	17.6 × 10 ⁴ /ul	ALT	8 IU/l
		LDH	120 IU/l
Tumor Marker		BUN	42.8 mg/dl
CEA	0.8 ng/ml	Cre	0.8 mg/dl
CA19-9	8.3 U/ml	Amy	78 IU/l
		Glu	79 mg/dl
Serological examination		Na	135 mEq/l
HBs-Ag	(-)	K	4.3 mEq/l
HCV-Ab	(-)	Cl	104 mEq/l
TPHA	(-)		

flat, without mass lesions or tenderness. A rectal examination revealed melena stool with coagulated blood.

Blood biochemistry findings: The initial hemoglobin (Hb) level was 5.6 g/dl and hematocrit was 17.1%. An increasing blood urea nitrogen seemed to indicate gastrointestinal bleeding. Undernutrition was indicated by a serum total protein level of 5.5 g/dl and serum albumin level of 2.6 g/dl; however, tumor marker levels were normal (Table 1).

The patient was admitted after being diagnosed with preshock due to gastrointestinal bleeding. Upper and lower endoscopy and contrast-enhanced computed tomography were performed on the day of hospitalization.

Findings on upper gastrointestinal endoscopy: Although mucous membrane pallor and multifocal erosions were observed in the gastric antrum, active hemorrhagic lesions or adherent clots that may have caused a serum Hb of 5.6 g/dl were not observed.

Findings on lower gastrointestinal endoscopy: Endoscopy was performed using a fiberscope with a CO₂ supply and irrigation. Although a number of adherent clots were visualized throughout the colon to the cecum, hemorrhagic lesions (including diverticula) were not found. Moreover, no hemorrhagic lesions were found in the region of the terminal ileum, although adherent clots were also visualized.

Thus, a diagnosis of obscure gastrointestinal

bleeding (OGIB) was made.

Findings from the abdomen/pelvis using multidetector computed tomography (MDCT): The source of bleeding could not be determined. No lesions suggestive of intraperitoneal neoplasia were found.

The patient was considered hemodynamically stable after infusions and a blood transfusion.

CE was performed that evening, and the results were analyzed the next morning.

CE findings: Findings were noted as the capsule passed through the stomach 2 h and 18 min after capsule ingestion. Adherent clots were sporadically evident in the small intestinal mucosa after 2 h and 35 min and became increasingly evident until 2 h and 37 min when the presumed diverticulum and clots were visualized. The position of the capsule was estimated to be the upper jejunum, just past the ligament of Treitz using analytical software. Anal diverticula were not visualized (Fig. 1).

The patient's general status improved after infusions for undernutrition and blood transfusions were administered. She had no additional episodes of rectal bleeding. DBE was performed via an oral route for a definitive diagnosis.

DBE findings: Comparatively large diverticula were visualized nearby, although they did not appear to be actively bleeding at the time of the examination (Fig. 2).

A small bowel series was performed concurrently.

Findings from the small bowel series: Three diverticula approximately 10 cm in size were visualized in the upper jejunum past the ligament of Treitz (Fig. 3).

Therefore, the upper jejunal diverticula were determined to be the source of bleeding.

An elective laparoscopy-assisted small bowel resection was undertaken because of recurrent bleeding from the same region while the patient was in the process of returning to a normal diet.

Operative findings: A single-incision laparoscopic surgery port was introduced through a 2.5 cm skin incision in the umbilical region. An adjustable fiberscope and forceps were inserted through

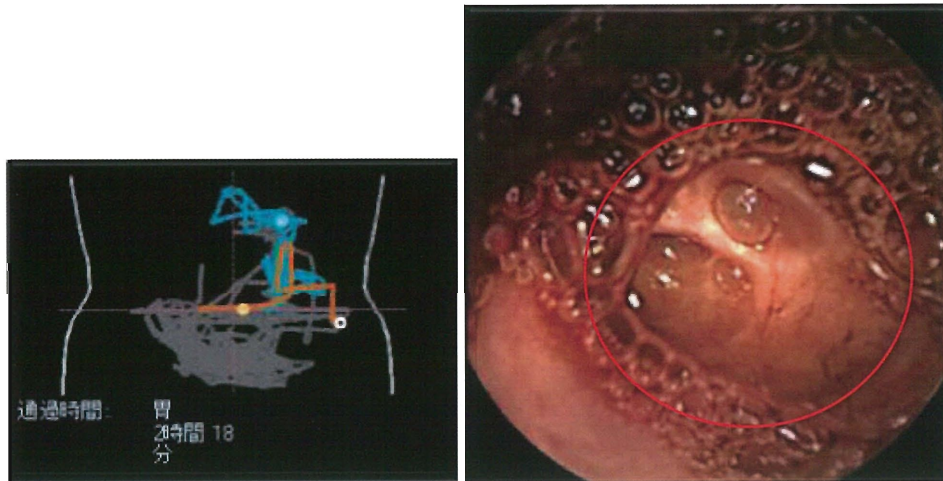


Fig. 1 Findings from capsule endoscopy (CE)

The capsule passed through the stomach 2 h and 18 min after ingestion. The presumed diverticulum and clots were visualized at 2 h and 37 min. The position of the capsule at this point was estimated to be the upper jejunum, just past the ligament of Treitz, using analytical software.

Red circle: diverticulum.

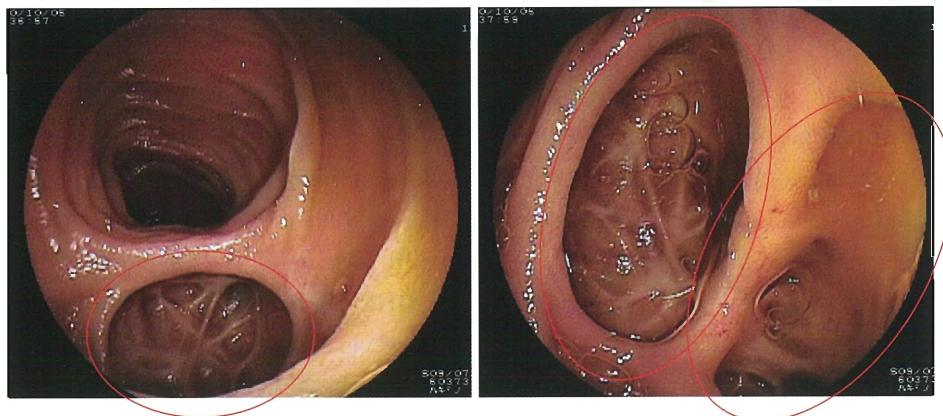


Fig. 2 Findings from double-balloon endoscopy (DBE)

Red circle: diverticulum.

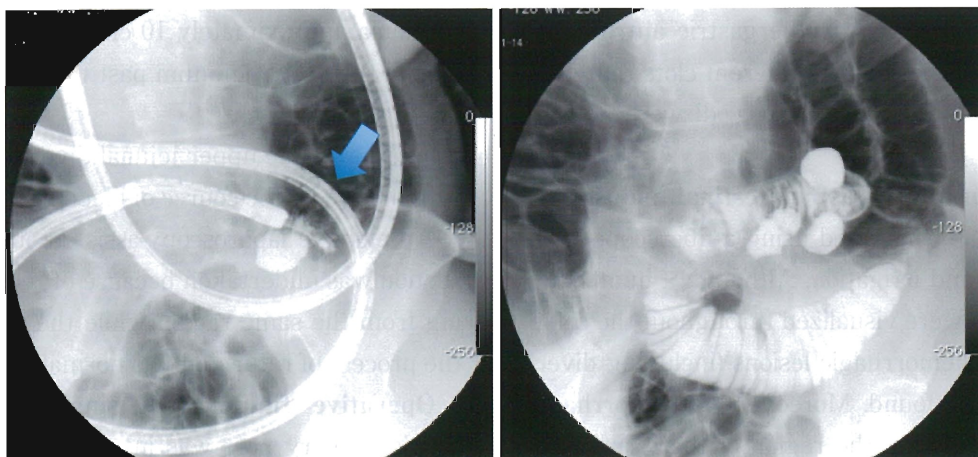


Fig. 3 Findings from small bowel series

Blue arrow: Treitz ligament.

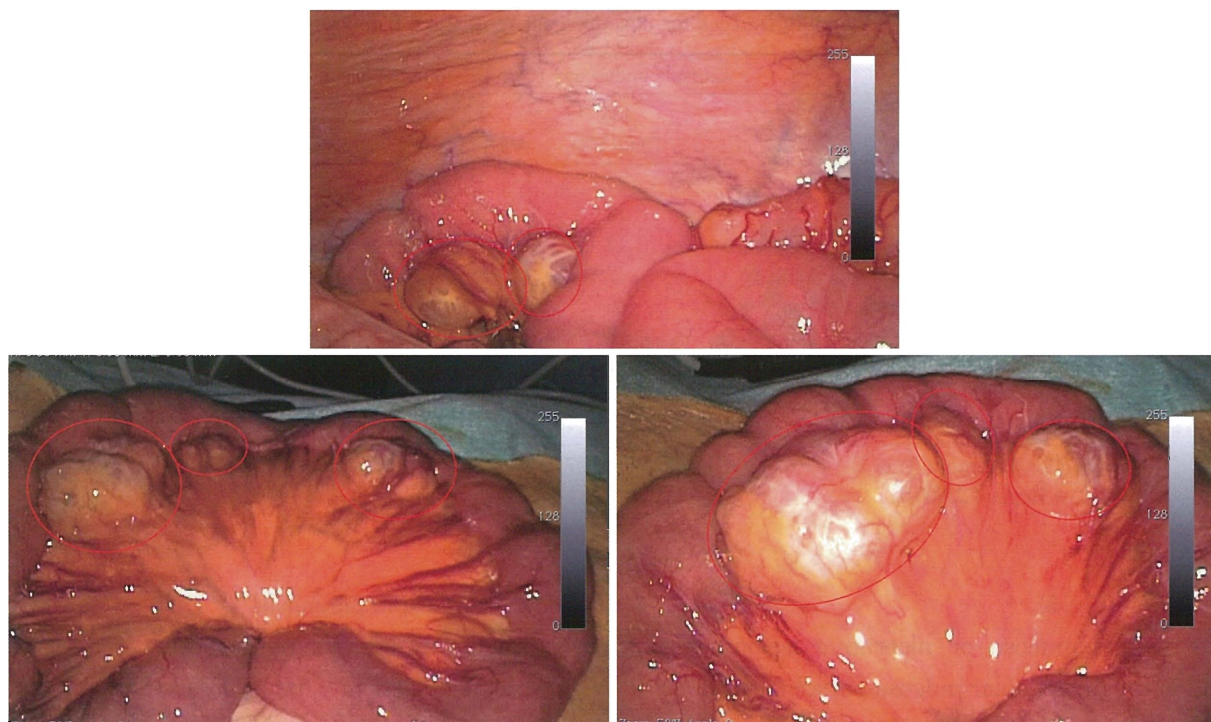


Fig. 4 Jejunal diverticula

Intra-operative photograph demonstrating multiple jejunal diverticula. Note that the diverticula arise at the mesenteric border.

Red circle: Jejunal diverticula.

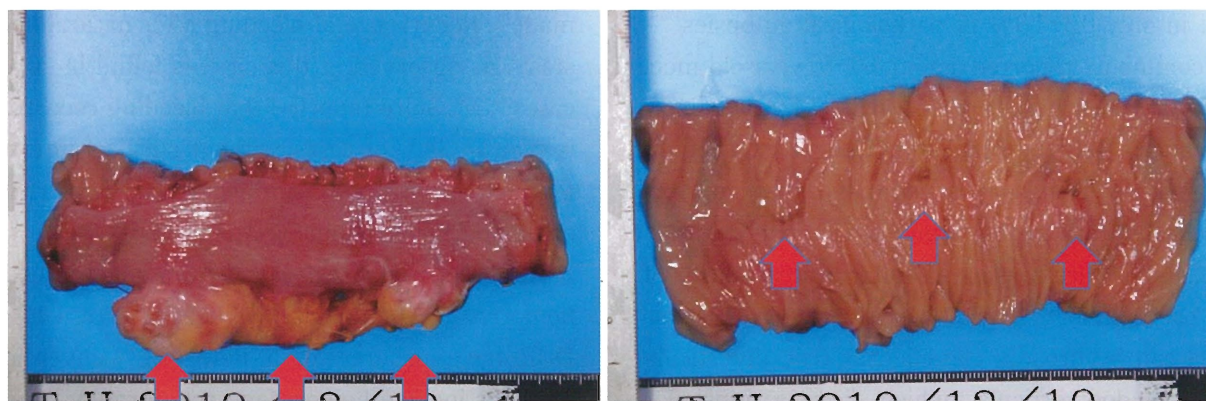


Fig. 5 Resected specimen

Diverticula with a maximum size of 3 cm can be clearly seen in the mesentery from the serosal side with diverticular openings of 5 mm evident from the mucosal side.

Red arrow: diverticulum.

the port. No intra-abdominal ascites or bleeding was visualized. As expected, several diverticula were found upon examination of the upper jejunum. Three diverticula were found on the mesenteric side when the bowel was withdrawn extraperitoneally from the port. A small bowel resection of the affected segment was carried out. Operative dura-

tion was 75 min with blood loss of 10 ml (Fig. 4).

Resected specimen: Diverticula with a maximum size of 3 cm were clearly seen in the mesentery from the serosal side, and diverticular openings of 5 mm were evident from the mucosal side. A diagnosis of diverticular bleeding by CE could be missed if not performed at a relatively early stage of clot ac-

Table 2 Bleeding sources for obscure gastrointestinal bleeding (OGIB)

	Capsule endoscopy (CE)	Double-balloon endoscopy (DBE)
OGIB	135	66
Identification (rate)	70 (51.9%)	50 (75.8%)
Ulceration · erosion	24	18
Vascular lesions	18	7
Neoplastic lesion	12	10
Crohn's disease	7	2
Lesion out of the small intestine	6	6
Behçet's disease	2	2
Small intestine diverticulum	1	0
Bile duct bleeding	0	1
Others	0	4

(CE: Nakamura T, et al. *Gastroenterol Endosc* 49, 2007, DBE: Yamamoto H, et al. *Clin Gastroenterol Hepatol* 2, 2004)

cumulation (Fig. 5).

No ectopic mucosa or ulcerative lesions were found in the diverticular mucosa pathologically.

The patient was free of postoperative complications and was able to begin eating normally without problems. No recurrence of bleeding has been observed since the surgery.

Discussion

A jejunal diverticulum is a rare disease and evident in only 0.3–1.3% of pathological autopsies^{1)–4)} but commonly reported among 60–70-year-old men. The first cases were reported in 1794 by Soemmering and in 1807 by Sir Astley Cooper⁵⁾. Of the jejunoileal diverticula, it is estimated that approximately 80% are in the jejunum, 15% are in the ileum, and 5% are present in both, with two-thirds of the cases involving multiple diverticula⁶⁾. Diverticula can be broadly classified as true diverticula and pseudodiverticula, which lack a muscular layer⁷⁾. Most true diverticula are congenital, with the majority being Meckel's diverticula. In contrast, pseudodiverticula are generally acquired and occur mainly in the mesentery⁸⁾. Jejunal diverticula are rare; only 10–30% of patients exhibit symptoms and are diagnosed, making the disease extremely rare. Thus, the disease is difficult to identify by a differential diagnosis. In addition to bleeding, symptoms can include malabsorption, torsion, diverticulitis, obstruction, abscess, and perforation. In contrast to the present case, other cases have been reported involving hemorrhage and requiring emergency sur-

gery after a rapid diagnosis¹⁾⁹⁾¹⁰⁾.

Although bleeding is observed in 3.4–8.1% cases of jejunal diverticula, only 60 cases have been reported to date in journals of the English language³⁾¹¹⁾. Most cases of jejunal diverticular bleeding involve the sudden appearance of massive hemorrhagic stools without gastrointestinal symptoms, and the disease history and physical findings are usually unrelated to the diagnosis when it is initially made¹⁰⁾. Recurrence of bleeding after natural hemostasis, as observed in this case, is found in 20% of cases¹²⁾. McGuire reported that bleeding recurrence is seen in 38% of cases without surgical intervention, although 75% of diverticular hemorrhage cases undergo spontaneous hemostasis¹³⁾.

Although regional diagnosis of a small intestinal hemorrhage is difficult, we believe that CE and DBE have ushered in a new era. Conventional methods include hemorrhage scintigraphy, angiography, and MDCT. These exams are extremely useful for detecting the source of active bleeding. Although bleeding scintigraphy can identify a small degree of blood loss (0.01–0.1 ml/min)¹⁴⁾¹⁵⁾, it is not suitable for accurate regional diagnosis. Furthermore, a limited number of facilities can perform the procedure. Angiography can distinguish bleeding of 0.5 ml/min while allowing for concurrent embolization¹⁶⁾¹⁷⁾. MDCT is more sensitive than angiography because it can distinguish bleeding of 0.3 ml/min^{18)–20)} and can easily and accurately distinguish the site of hemorrhage.

However, a regional diagnosis is difficult in cases of no active bleeding, as observed in this case.

A combination of CE and DBE are effective in such cases. When CT shows no obvious gastrointestinal obstruction, the patient only needs to ingest one capsule at night, and the results are available for analysis the next morning.

When the lesion, approximate location, and the state of bleeding have been ascertained by CE, DBE can be conducted for hemostatic treatment and biopsy from the upper or lower region. Black ink injection is also a possibility in cases when surgery has been scheduled.

CE and DBE are complementary procedures for evaluating and treating OGIB^{21)~26)} because it is possible to obtain biopsies or administer therapy with DBE. Conversely, the low rates of achieving total enteroscopy in patients undergoing DBE is remedied by CE, which has complete examination rates of 83.6% in the setting of OGIB²⁷⁾. Moreover, Bar-Meir reported that 20–35% of patients with significant iron deficiency anemia (Hb < 10 g/dl) and negative initial CE have abnormalities detected on a second CE²⁴⁾. These lesions can be detected and treated by DBE, and an additional 30% of patients can be identified with OGIB when the initial CE is negative²⁸⁾.

DBE is indicated if CE detects a lesion requiring biopsy or endoscopic intervention or in patients with a high suspicion of small bowel bleeding despite a negative initial CE^{21)~23)25)26)29)~31)}.

Comparative data on cases of OGIB in which the source of bleeding was identified using CE and DBE are shown in Table 2³²⁾³³⁾. Although simple comparisons cannot be made because the CE data is from a multicenter collaboration of nine facilities and the DBE data is from one facility, DBE was superior for identification with figures of 51.9% for CE and 75.8% for DBE. Although only one case of bleeding from a small intestine diverticulum was present, this was probably due to the rarity of the disease. More than half of the cases involved erosion, ulceration, and vascular lesions, and in an aging society, these problems will likely become more pronounced as more patients ingest nonsteroidal anti-

inflammatory drugs (NSAIDs), highlighting the problematic link between NSAIDs and mucous membrane disorders of the small intestine. It will be increasingly important for surgeons to be familiar with these devices and methods as we approach a new era in which full examination of the digestive tract using CE and DBE becomes common.

Conclusion

This was a case of bleeding from jejunal diverticula with hemorrhagic preshock, which was diagnosed preoperatively by CE.

A summary of this paper was presented at the 36th Japanese College of Surgeons Annual Meeting (held in June 2011 in Tokyo).

The authors indicated no conflicts of interest.

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カプセル内視鏡により術前診断しえた、大量下血を呈した空腸憩室出血の1例

¹大月市立中央病院外科²東京女子医科大学第二外科

シンドウ	ヒロナリ	ノグチエイイチロウ	タケモト	カオリ
進藤	廣成 ^{1,2}	野口英一郎 ^{1,2}	竹本	香織 ^{1,2}
サイトウ	モトノブ	ニッタ	スミオ	カメオカ
齋藤	元伸 ^{1,2}	新田	澄郎 ¹	亀岡
				シンゴ
				信悟 ²

症例は76歳の女性。ふらつき、黒色便を主訴に内科を受診した。Hb 5.6 g/dl, 血圧 90 mmHg 台を呈し、消化管出血によるプレショックの診断にて、外科緊急入院となった。上部・下部内視鏡、造影CT検査を施行するも明らかな出血源を同定し得なかったため、カプセル内視鏡検査(CE)を施行。上部空腸に憩室と思われる所見と、同部にコアグラの付着、それ以降の小腸には赤黒～黒色の内容物を認めた。以上より同部からの出血と診断した。保存的加療により出血は止まったが、精査目的にダブルバルーン小腸内視鏡検査(DBE)を施行。上部空腸に巨大憩室を認めた。また同時に施行した小腸造影検査にて、近傍に数個の憩室を認めた。巨大空腸憩室の診断のもと、全身麻酔下にSILS法による腹腔鏡補助下小腸(憩室)切除術を施行した。空腸の憩室出血は稀であり、その診断にCEとDBEの併用は有用であった。今回術前に診断しえた症例を経験したので、若干の文献的考察を加えて提示する。