

[CASE REPORT]

Small-bowel Capsule Endoscopic Features in Patients with Eosinophilic Gastroenteritis: Three Case Reports

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Abstract:

Eosinophilic gastroenteritis (EGE) is an uncommon disease characterized by eosinophilic infiltration of the gastrointestinal tract in the absence of secondary causes and presents with a variety of gastrointestinal manifestations. Important diagnostic evidence for EGE can be provided by endoscopy; however, the specific small-bowel capsule endoscopic (SBCE) findings remain unknown. We herein report the SBCE findings of three cases of EGE as well as those of the previous cases. The most common findings in patients with EGE were multiple erythema and erosions with surrounding redness on SBCE; these findings should be considered for the diagnostic evaluation for EGE.

Key words: eosinophilic enteritis, erythema, small bowel erosion, video-capsule endoscopy

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Introduction

Eosinophilic gastroenteritis (EGE) is a rare and heterogeneous inflammatory disorder that is characterized by dense eosinophilic infiltration of the gastrointestinal (GI) tract in the absence of other known causes of tissue eosinophilia, such as parasitic and bacterial infections, inflammatory bowel disease, hypereosinophilic syndrome, connective tissue disorder, myeloproliferative neoplasms, and drug hypersensitivity (1, 2).

Although there are hundreds of case reports on EGE, its epidemiology, etiology, and pathophysiology are not yet established. The stomach and small intestine are commonly involved, whereas colonic involvement is less frequent (2). Patients also present with a variety of gastrointestinal manifestations (3). Based on its clinical manifestations and the depth of eosinophilic infiltration into the GI tract, EGE is classified into three different types: predominantly mucosal disease, which comprises the majority of EGE cases; predominantly muscular disease; and predominantly serosal disease (4). To diagnose EGE, clinicians need to have a high degree of clinical suspicion and to correlate this with radio-

logical images and endoscopic findings (3).

Small-bowel capsule endoscopy (SBCE) and double-balloon enteroscopy (DBE) enable the visualization of lesions in the entire small intestine, indicating their usefulness for the detection of EGE lesions, especially in predominantly mucosal disease. However, only a few reports have detailed the capsule endoscopic findings of EGE (5-14).

We herein report three cases of predominantly mucosal EGE and demonstrate several potentially significant SBCE findings.

Case Reports

Case 1

A 62-year-old woman presented to our hospital with several years' history of watery diarrhea up to 3 times a month. She has a medical history of asthma and allergic rhinitis. Laboratory studies revealed no peripheral blood eosinophilia (150/ μ L; normal range 30-570) and normal immunoglobulin E (IgE) levels (96.1 IU/mL). A stool examination was negative for enteric pathogens. Total colonoscopy (TCS) revealed erosions in the terminal ileum. A histological examination of

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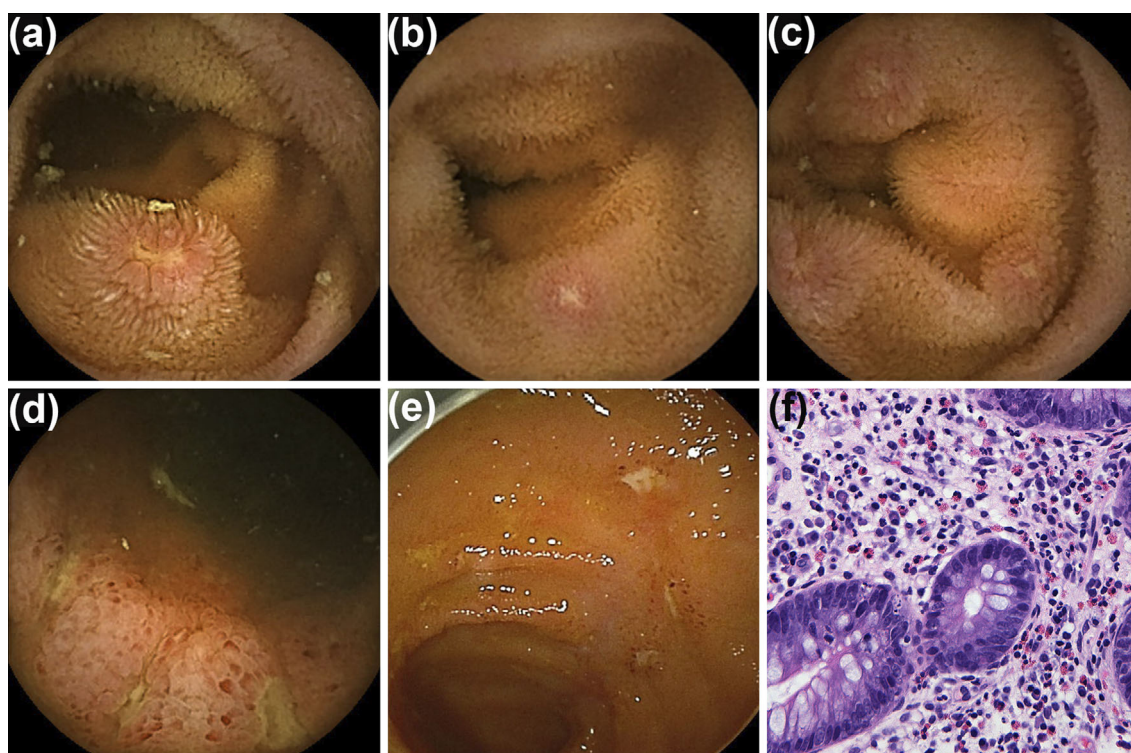


Figure 1. Representative images of case 1. a-c: Capsule endoscopy (PillCam SB3; Covidien, Tokyo, Japan) showing multiple small erosions with surrounding redness, c: Numerous lesions were shown in one screen in the ileum, d: Swollen villi, erosions, and linear ulceration in the terminal ileum, e: Double-balloon enteroscopy showing multiple small erosions with surrounding redness, f: Histological images (Hematoxylin and Eosin staining, $\times 400$) of biopsy specimens from the ileum showed eosinophilic infiltration.

the biopsied erosions revealed marked eosinophilic infiltration [maximum 140 eosinophils/high-power field (HPF)] in the lamina propria. The patient had no pertinent findings on esophagogastroduodenoscopy (EGD) or computed tomography (CT). SBCE revealed multiple small erosions with surrounding redness throughout the small intestine (Fig. 1a-c) and swelled villi, erosions, and linear ulcers in the terminal ileum (Fig. 1d). A histological examination of the biopsied ileal erosion via DBE (Fig. 1e) revealed eosinophilic infiltration (maximum 100/HPF, Fig. 1f). These findings were compatible with a diagnosis of predominantly mucosal EGE. The patient has mild symptoms and is being followed up without steroid treatment.

Case 2

A 66-year-old woman presented to our hospital with a 3-year history of anorexia and abdominal pain. She had no history of allergies. Laboratory studies revealed no peripheral blood eosinophilia (110/ μL ; normal range 30-570) and normal IgE levels (59.3 IU/mL). Abdominal CT revealed no intestinal wall thickening. TCS revealed multiple erosions in the terminal ileum, which were histologically found to have marked eosinophilic infiltration (maximum 70/HPF) in the lamina propria. SBCE revealed multiple small erosions with surrounding redness throughout the small intestine and linear ulcers in the terminal ileum (Fig. 2a-d), which were also

histologically found to have eosinophilic infiltration (maximum 60/HPF, Fig. 2e). Thus, we made a diagnosis of predominantly mucosal EGE. This patient is followed up without steroid treatment due to her mild symptoms.

Case 3

A 52-year-old woman presented with abdominal pain and diarrhea, which recur two or three times a year and last 1-2 weeks per episode. She has a history of asthma, eosinophilic sinusitis, and allergy (cedars, cats, dust mites, and shellfishes). Laboratory studies revealed no peripheral blood eosinophilia (550/ μL ; normal range 30-570) and normal IgE levels (65.5 IU/mL). Abdominal CT findings were unremarkable. EGD revealed edematous mucosa in the esophagus, stomach, and duodenum, as well as redness in the antrum of the stomach. A histological examination of biopsy specimens from the esophagus, stomach, and duodenum indicated eosinophilic infiltration (maximum 16, 90, 100/HPF). SBCE revealed multiple small erosions with surrounding redness, which tended to increase in the distal ileum (Fig. 3a-d). TCS revealed erosions in the terminal ileum, which indicated eosinophilic infiltration (maximum 100/HPF, Fig. 3e). Thus, we diagnosed this as a case of predominantly mucosal EGE. The patient's symptoms improved after treatment with oral prednisolone (5 mg every 2 days), which was prescribed for the exacerbation of eosinophilic si-

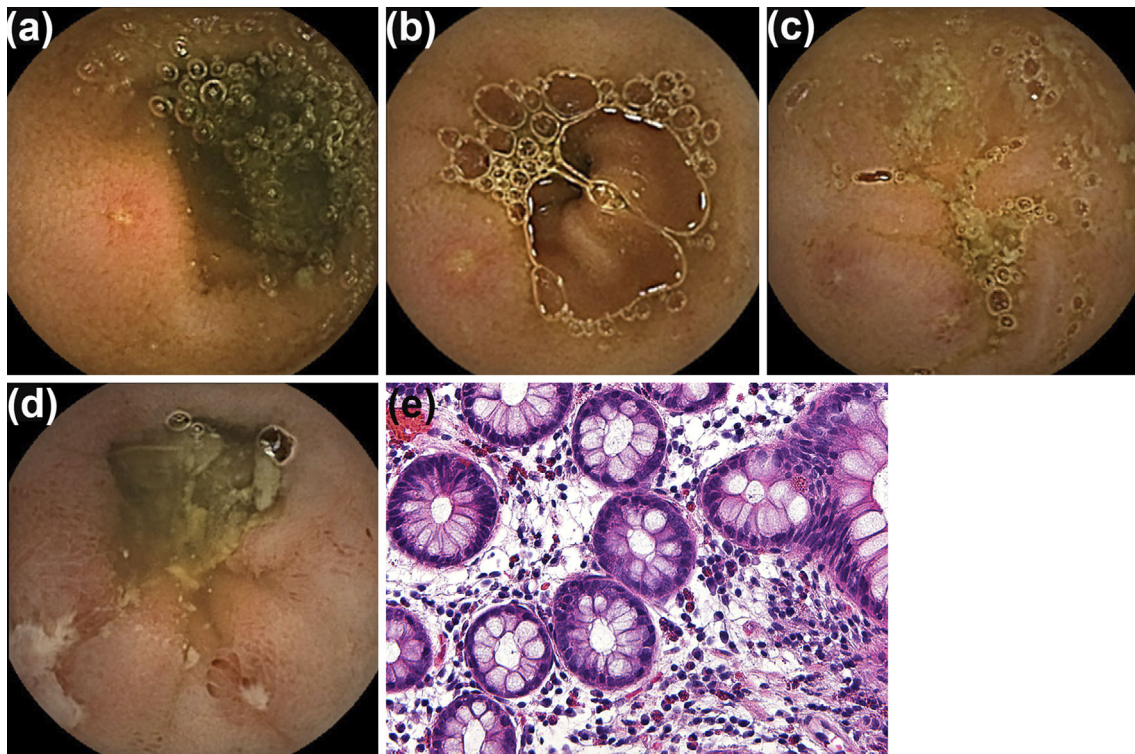


Figure 2. Representative images of case 2. a-c: Capsule endoscopy (PillCam SB3; Covidien) showing multiple small erosions with surrounding redness, d: Linear ulcers in the terminal ileum, e: Histological images (Hematoxylin and Eosin staining, ×400) of biopsy specimens from the ileum showed eosinophilic infiltration.

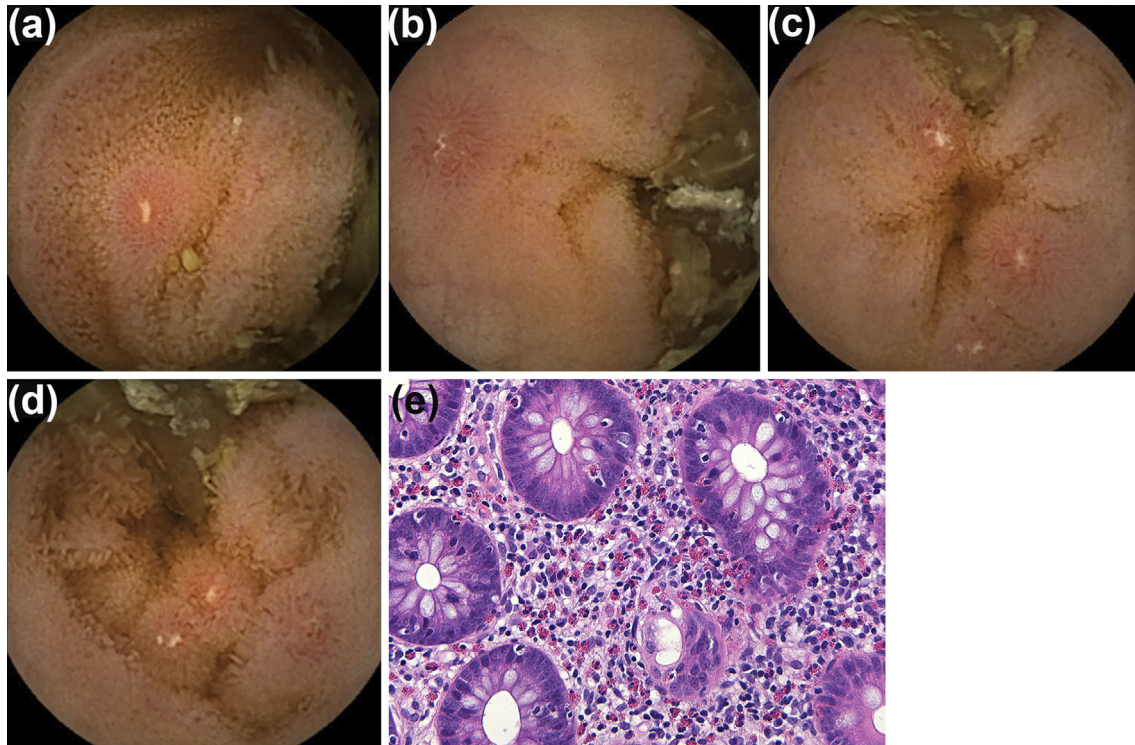


Figure 3. Representative images of case 3. a, b: Capsule endoscopy (PillCam SB3; Covidien) showing small erosions with surrounding redness, c, d: Multiple erosions in the distal ileum, e: Marked eosinophilic infiltration (Hematoxylin and Eosin staining, ×400).

Table. Small Bowel Capsule Endoscopic Findings of the Present and Previously Reported Patients with EGE.

Reference	Age/ Sex	Distribution of small intestinal lesions	SBCE findings					
			Multiple erythema	Flat/ loss of villi	Erosions	Ulceration	Stenosis	Others
5	47/F	Throughout	+	+	-	-	-	-
6	37/F	Mid-ileum to the ileocecal valve	-	-	-	-	-	^a Dark blue coloration of the deeper layer
7	32/M	Ileum	-	+	-	+	+	(retention)
8	41/M	Throughout	+	+	-	-	-	-
9	32/M	Proximal jejunum	-	-	-	+	+	(retention)
10	48/M	Proximal jejunum and ileum	+	-	+	+	+	-
11	59/M	Proximal jejunum	+	-	-	-	-	-
12	2/M	Jejunum to proximal ileum	+	-	-	-	-	-
13	28/F	Ileum	-	-	-	+	+	(retention)
14	45/F	Proximal jejunum	+	+	+	-	-	-
					(with redness)			
The present cases	62/F	Throughout	-	-	+	+	-	-
					(with redness)			
	66/F	Throughout	-	-	+	+	-	-
					(with redness)			
	52/F	Throughout	-	-	+	-	-	-
					(with redness)			

^aThis case was diagnosed as a predominantly serosal type of EGE. All other cases were thought to be a predominantly mucosal type of EGD upon reviewing each paper.

EGE: eosinophilic gastroenteritis, SBCE: small bowel capsule endoscopy, M: male, F: female

nusitis.

Discussion

EGE is characterized by eosinophilic infiltration of the gastrointestinal tract. The precise prevalence of EGE is unclear; however, in the USA, it is estimated to be approximately 2.5-30/100,000 with a man-to-woman ratio of 1.2:1, whereas in Japan, the reported estimates are 5.5 times higher than those of the USA with the same sex ratio (3). The most common symptoms of EGE include abdominal pain, nausea, vomiting, dysphagia, diarrhea, and more serious manifestations, such as intestinal obstruction or perforation. Furthermore, up to 70% of patients with EGE have a history of atopic conditions, such as asthma, allergic rhinitis, or atopic dermatitis, as well as allergy to food or pollen (2, 3). All of the patients in this study were female and experienced symptoms of abdominal pain, anorexia, and diarrhea, with two of the three having a history of atopic conditions.

Over 95% of the patients with EGE reportedly have detectable endoscopic abnormalities on the intestinal mucosal surface; however, no specific endoscopic findings have been found thus far (15). We searched on PubMed using the keywords "eosinophilic gastroenteritis" and "capsule endoscopy" or "eosinophilic enteritis" and "capsule endoscopy," and found 13 reports from 2005 to 2020. Ten of these reports described some of the SBCE findings of EGE (Table) (5-14), including multiple erythema (n=6), erosion or

ulceration (n=5), flat or absent villi (n=4), and stenosis with (n=4) or without capsule retention (n=3). A dark blue coloration of the deeper layer was observed in a very rare case diagnosed as predominantly serosal EGE (6). Multiple erythema and erosions with surrounding redness were most frequently reported. In the present report, all cases had multiple erosions with surrounding redness detected on SBCE. Thus, SBCE may have a significant diagnostic value for the diagnosis of EGE. These findings may be overlooked as non-specific at first glance. However, if it can be proven that such findings are common in EGE, further examinations will be encouraged, including DBE and histological evaluations, which may lead to a more precise diagnosis. We believe that no conclusions can be drawn solely from the present report and that further studies are required.

Retention was reported in 3 of the 10 cases of EGE (Table). In one of the three cases, the SBCE was stuck in the ulcerated ileal stricture with mucosal fissuring, and partial ileal resection was performed to retrieve it (7). In the other two cases, the capsule endoscope was retained in circumferential ulcerative stenosis, although the SBCE was spontaneously eliminated without clinical symptoms in one case (9) and with oral budesonide treatment in the other (13). The frequency of SBCE retention and such circumferential stenosis in EGE is unclear, so an evaluation of gastrointestinal patency may need to be considered before SBCE in cases of suspicious EGE using a patency capsule test.

In one of the present cases, the number of lesions increased from the jejunum toward the distal ileum. The

eosinophil distribution in the normal adult GI tract is known to increase from the esophagus to the right colon and decrease in the left colon (16). Thus, the worsening trend of mucosal findings to the ileum may be associated with differences in the eosinophil distribution in the GI tract.

In addition to EGE, erosive lesions of the small intestine may be observed in various other pathological conditions, such as drug-induced mucosal injury caused by nonsteroidal anti-inflammatory drugs (NSAIDs) and aspirin, Crohn's disease, celiac disease, IgA vasculitis, lupus enteritis, amyloidosis, graft-versus-host disease, and tumors, including lymphoma. Even in patients who do not suffer from any of these conditions, small erosions are sometimes observed, and the etiology may not be clearly understood. In fact, it was reported that small intestinal injury was observed in 71% of the patients with arthritis who took NSAIDs, while 10% of patients who were non-users of NSAIDs also had small intestinal injury (17). It is challenging to differentiate these entities based on SBCE findings alone, requiring the addition of pathological findings as well as drug histories, clinical backgrounds, and medical histories. In particular, about half of patients with EGE often have allergic diseases, such as asthma (15), which may aid in the differential diagnosis.

The diagnosis of EGE is based on symptoms and eosinophilic infiltration of tissues, and a biopsy with a balloon endoscope (BE) is necessary to evaluate the histology of the small intestine. However, considering the physical stress, the less-invasive SBCE seems to be useful for diagnosing the presence and extent of small intestinal lesions of EGE and monitoring the outcome of the lesions. In addition, there is a report (18) that the detection rate of small intestinal lesions was more favorable with SBCE than with BE. We believe that the complementary use of SBCE and BE will provide a better understanding of the pathophysiology of EGE, which in turn will further improve the management of EGE.

In conclusion, we described the SBCE findings of our three cases and discussed these alongside previously reported cases of EGE. The most common SBCE findings in patients with EGE were multiple erythema and erosions with surrounding redness. Although this paper included only a small number of patients and our findings require further validation, multiple erythematous lesions in the small intestine should raise suspicion for EGE.

The authors state that they have no Conflict of Interest (COI).

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