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Enteroclysis in obscure gastrointestinal system hemorrhage of small bowel origin*

İnce barsak kaynaklı gizli gastrointestinal sistem kanamalarında enteroklizis'in yeri

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Background/'aims: *The diagnostic value of enteroclysis in patients with obscure gastrointestinal bleeding of small bowel origin was evaluated. Further diagnostic approaches in patients in whom enteroclysis did not yield a source for bleeding are discussed.* ***Methods:*** *A total of 62 patients with gastrointestinal bleeding of obscure origin were retrospectively evaluated by enteroclysis. Patients in whom a specific pathology could not be identified on enteroclysis were further followed-up clinically and by laboratory examinations. Recurrent gastrointestinal bleeding had been considered an indication for further diagnostic evaluation.* ***Results:*** *Accurate cause of the pathology which may explain the source of bleeding was achieved via enteroclysis in 29 of the patients. Of the pathologies, most were inflammatory bowel disease (n=18), followed by neoplasms (n=4), malabsorption (n=3) and miscellaneous disorders (n=4). Thirty-three patients had normal findings on enteroclysis. Six patients were diagnosed as angiodysplasia on angiography and nine patients had either gastritis or duodenitis. A final diagnosis to explain the source of bleeding could not be achieved in 18 cases.* ***Conclusion:*** *Enteroclysis provides essential information in gastrointestinal bleeding of obscure origin and its role in the diagnosis should not be undermined. Recurrent and consistent GI bleeding should be considered an indication for further diagnostic evaluation.*

Key words: Gastrointestinal bleeding, small bowel, enteroclysis, endoscopy

Amaç: Enteroklizis'in, incebarsak kaynaklı gizli gastrointestinal sistem kanaması olan hastalarda etyolojiyi aydınlatmada tanısal değeri araştırıldı. Enteroklizis'in kanama kaynağı hakkında yeterli bilgi vermediği hastalarda kullanılabilecek ileri tanısal yaklaşımlar tartışıldı. ***Yöntem:*** *Enteroklizis ile incelenen, nedeni belirlenememiş gastrointestinal kanaması olan toplam 62 olgu retrospektif olarak değerlendirildi. Enteroklizis ile spesifik bir patoloji saptanmayan hastalar ileri klinik ve laboratuar takibe alındı. Tekrarlayan gastrointestinal kanama, ileri tanısal değerlendirmeler için endikasyon olarak kabul edildi.* ***Bulgular:*** *62 hastanın 29'unda, enteroklizis ile gizli kanama nedenini açıklayan patolojik radyolojik bulgular elde edildi. Bu 29 olgunun çoğunluğunu inflamatuar barsak hastalıkları (18) oluşturmaktaydı diğerleri ise sırasıyla tümörler (4), malabsorbsiyon sendromu(3) ve farklı patolojiler(4) şeklinde idi. Otuz üç hastada enteroklizis ile normal bulgular elde edildi. Bunlardan 6'sı anjiyografi ile anjiyodisplazi tanısı alırken, 9 hastada gastrit ya da duodenit saptandı. On sekiz hastada kanama odağını açıklayabilecek nihai tanıya ulaşılamadı. Sonuç: Enteroklizis, nedeni belirlenemeyen gastrointestinal sistem kanamalarında çok önemli ve temel bilgiler sağlamakta olup, tanıdaki yeri göz ardı edilmemelidir. Tekrarlayan ve inatçı gastrointestinal kanamalar ileri tanısal değerlendirmeler için endikasyon kabul edilmelidir.*

Anahtar kelimeler: Gastrointestinal kanama, ince barsak, enteroklizis, endoskopi

Gastrointestinal (GI) bleedings are responsible for a large number of hospital admissions. In some reports, they account for 2% of all hospitalizations (1-3). The most common location of GI bleeding is the upper system (esophagus, stomach and duodenum; 70%), followed by the lower system (cecum, colon and rectum; 25%). Bleeding of small intestinal origin is seen in approximately 5 to 10% of cases. Good patient history and physical examination are two main factors to determine the diagnostic algorithm. Patients in whom upper GI bleeding is primarily considered should first be evaluated via endoscopy and/or upper GI series. Clinical and laboratory examinations suggestive of lower GI bleeding should be studied by colonoscopy and/or double contrast barium enema examinations. Des-

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pite these diagnostic attempts, the source of GI bleeding cannot be demonstrated and still goes undetected in 5% of the cases. This kind of bleeding is referred to as obscure gastrointestinal bleeding (OGIB) (4-6).

Obscure gastrointestinal bleeding has a wide spectrum and may be either acute or chronic, intermittent or continuous. It may range from oozing manifested with brown heme-positive stools, to massive bleeding with melena (7). The majority of causes of OGIB are located in the small bowel (8). Several endoscopic and radiologic studies are available to assist in localization of the precise source within the small bowel. Of the radiologic methods, enteroclysis (EC), is the most sensitive procedure (7).

Our study aimed to determine the overall diagnostic value of EC in identifying the cause of OGIB. Its role in further diagnostic and therapeutic approaches in patients with OGIB is also emphasized.

MATERIALS AND METHODS

The records of 1,560 patients who had undergone EC for identifying various causes of small bowel pathology at our department over a 10-year period (1992 - 2002) were reviewed retrospectively. Of these 1,560 examinations, patients who admitted for GI bleeding, whose stool examinations were positive on two or more occasions and whose upper GI endoscopy, colonoscopy and/or colon barium examinations did not show a possible source of bleeding were enrolled in the study.

Sixty-two patients fulfilled the above-mentioned criteria. Twenty-eight of the patients were male, and 34 were female. The age of patients ranged between 15 and 85 (mean: 43) years.

Enteroclysis had been performed via transnasal catheterization of the jejunum by a 12-French EC catheter. Barium suspension of 70% was used for opacification of the small bowel mucosa. The double contrast phase of the examination had been obtained by the use of 0.5% methylcellulose solution. The images had been obtained by a digital C-arm radiography unit (Polystar, Siemens, Erlangen, Germany).

The findings on EC were reviewed by one experienced radiologist (U.K.) who was blinded to the final diagnosis of the patients. The patients were divided into two groups: 1) patients who had small bowel pathologies on EC which could be the source of OGIB, 2) patients with normal findings on EC examination. The findings on EC were correlated with the ultimate clinical, surgical, and histopathological diagnosis.

The causes for OGIB identified on EC were managed accordingly by medical and/or surgical treatment. Patients in whom a specific pathology could not be identified on EC were regularly followed-up clinically and by laboratory examinations. Recurrent GI bleeding was considered an indication for further diagnostic evaluation. Upper GI system endoscopy was repeated in patients who presented with recurrent bleeding. Angiographic examination was performed in patients with a repeated but normal upper GI endoscopy, despite recurrent and consistent GI bleeding.

RESULTS

Accurate cause of the pathology which may explain the source of bleeding was achieved with EC in 29 of the patients.

The majority of these patients (18/29, 62%) demonstrated signs of inflammatory bowel disease (IBD). Out of 18 patients, 14 showed signs of early phase involvement of IBD, and four showed signs of intermediate phase of IBD. Signs of early phase inflammatory process on EC has been defined as linear and/or aphthous mucosal ulcerations, thickening of folds and granularity of the villi. Signs of intermediate phase inflammatory process on EC has been defined as scalloping with moderate amount of wall thickening, and linear, aphthous or spicular ulcerations of the mucosa. In 18 patients in whom the radiologic findings were suggestive of IBD, 10 patients were finally diagnosed as Crohn's disease (Figures 1 and 2), six were diagnosed to have intestinal tuberculosis (Figure 3), one patient was diagnosed to have eosinophilic enteritis, and one patient was diagnosed to have intestinal Behcet's disease (Figure 4).

In the remaining patients in whom a pathology was detected other than IBD, three (3/29, 10%) demonstrated alterations of the plicae circulares (jejunization or ileization), and celiac disease was the final diagnosis after immunohistochemical examination of the small bowel biopsy (Figure 5). Enteroclysis findings were suggestive of neoplasia in four patients (4/29, 13%) which consisted of three single cases of primary small bowel neoplasia (immunoproliferative small intestine disease, leiomyosarcoma, lymphoma) and one case of se-

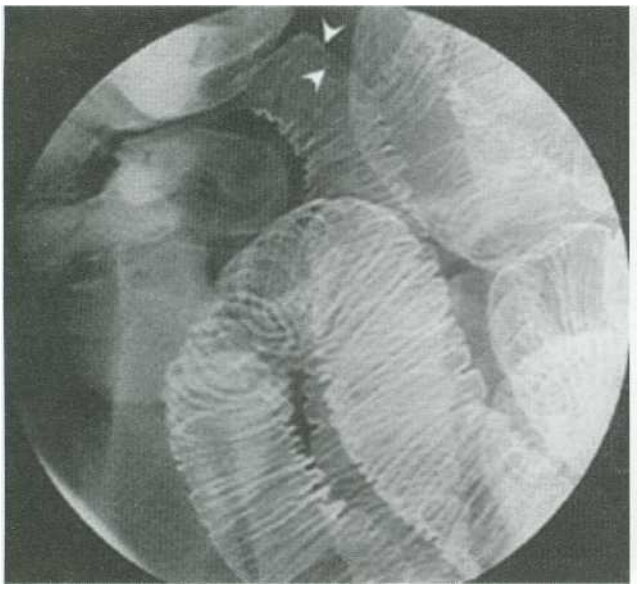

Figure 1. Enteroclysis view of a 21-year-old man with Crohn's disease (early stage involvement). Aphthous ulcerations (white arrowheads) and thickening of the folds of the terminal ileum are seen on this enteroclysis examination

condary neoplasia (colon carcinoma metastasis) (Figures 6-8). Miscellaneous single pathologies were observed in four patients (4/29, 13%). These were inverted Meckels diverticula (Figure 9), jejunal diverticulosis, Peutz-Jeghers syndrome, and postoperative adhesions. Regarding the location of

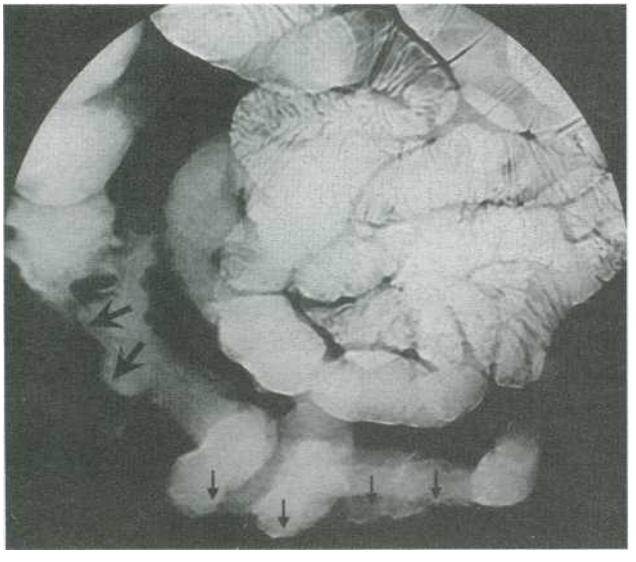

Figure 2. Enteroclysis view of a 46-year-old woman with Crohn's disease (intermediate stage involvement). Spicular ulceration and rigidity on the mesenteric border, and antimesenteric scalloping (large arrows) in the distal end of the terminal ileum are seen. Ulceronodular pattern (small arrows) is present in the distal ileum

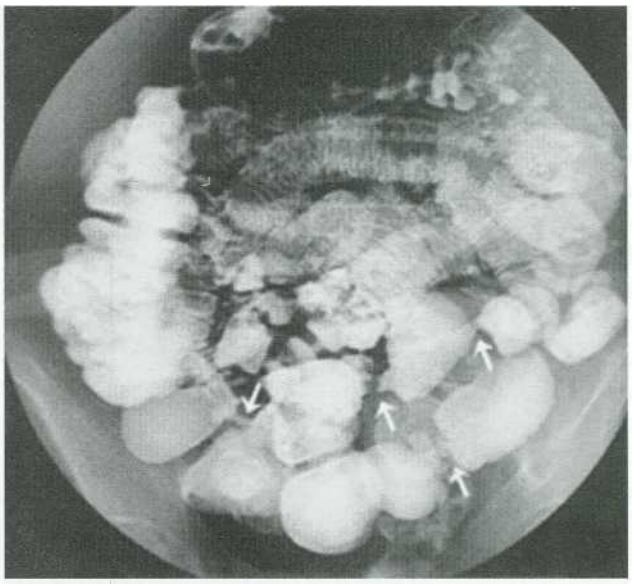

Figure 3. Enteroclysis view of a 45-year-old man with small bowel involvement of tuberculosis which demonstrates multiple hour-glass deformities (white arrows) at ileum

the pathologies, three involved the whole small bowel (3/29, 10%), six were within the proximal 100 cm of the small bowel (6/29, 20%), and the remaining 20 were beyond this localization (20/29, 69%), distal-terminal ileum being the most common segments. Table 1 summarizes the findings on EC and the correlation with clinical and/or surgical diagnosis.

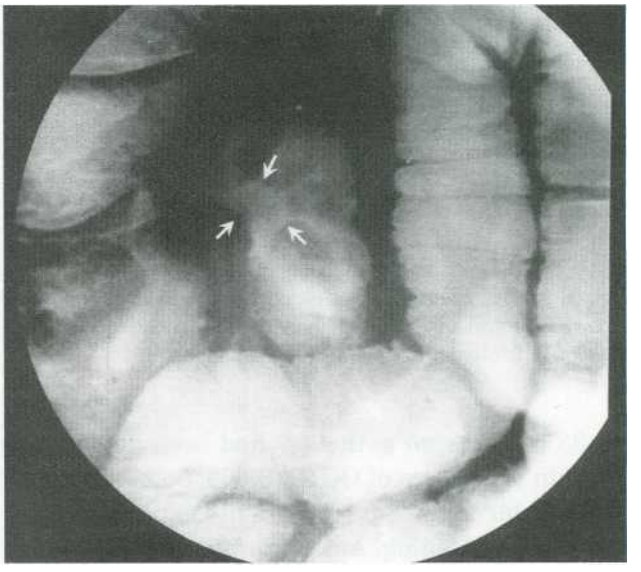

Figure 4. Enteroclysis view of a 23-year-old man with intestinal involvement of Behcet's disease. Aphthous ulcerations (white arrows) in the terminal ileum are seen (the patient had similar ulcers on his tongue)

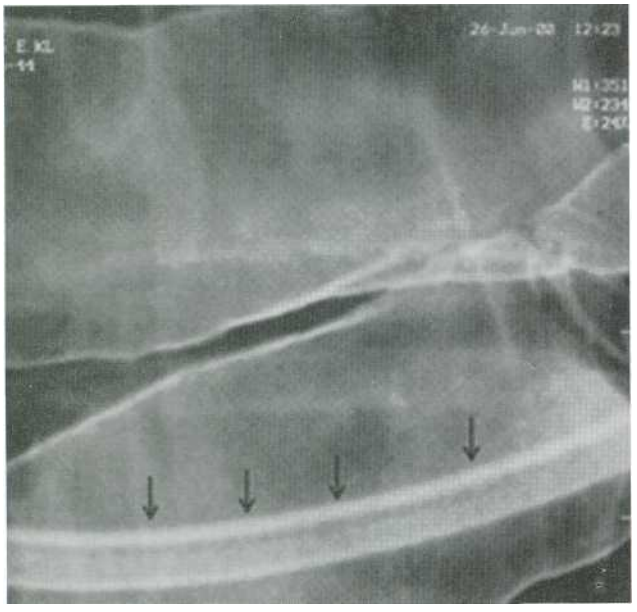

Figure 5. Magnified spot view of the jejunum in an EC demonstrating the effacement of the plica and the smooth granular mucosa (arrows indicate the enteroclysis catheter). The diagnosis was celiac disease

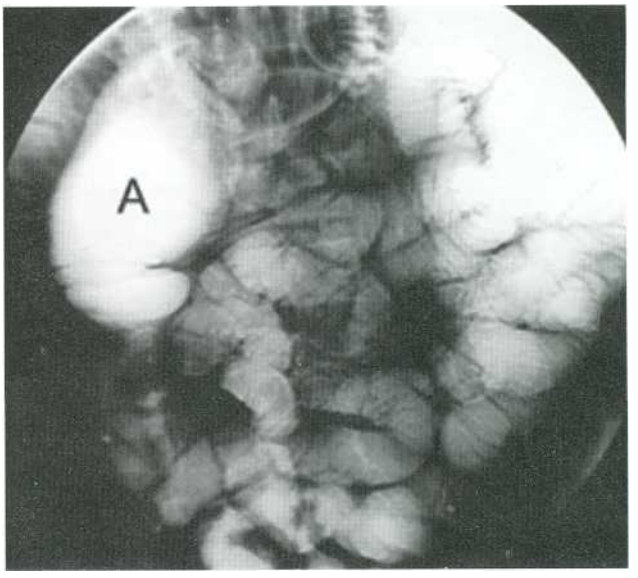

Figure 7. Enteroclysis view of a 26-year-old man with small bowel lymphoma showing prominent dilatation of a proximal jejunal segment (A) (aneurysmatic form of small bowel lymphoma)

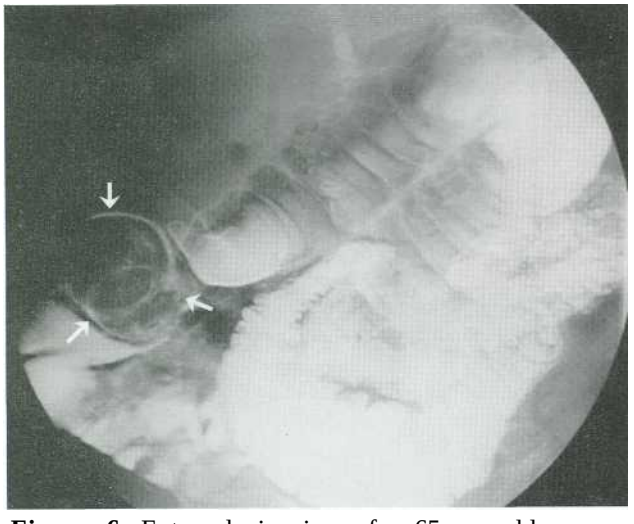

Figure 6. Enteroclysis view of a 65-year-old woman with primary leiomyosarcoma of the jejunum. A large intraluminal filling defect (white arrows) is seen. Note the spiral coil appearance due to the invagination and the proximally dilated small bowel segments

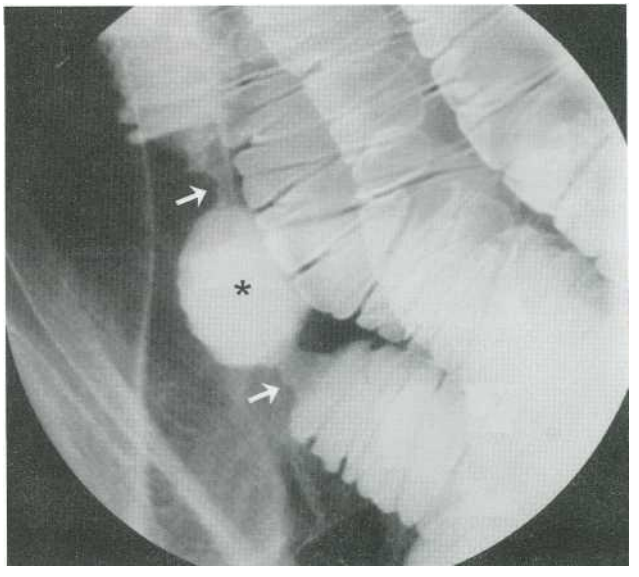

Figure 8. A 71-year-old man with colon carcinoma metastasis to the small bowel. On enteroclysis examination metastasis is presented in a focal distal ileal segment with strictures (white arrows) in both ends showing shoulder signs. Between the stenotic and rigid segment, partial focal dilatation (*) with effacement of the plica is seen

In 33 patients no pathology had been detected to explain the source of OGIB (33/62, 53%) (Table 2). On regular follow-up, 15 patients experienced recurrent GI bleeding. Among these, duodenal erosions in four, and hemorrhagic gastritis in five patients (a total of 9) were detected on repeated GI endoscopy. Six patients were found to have duodenal and proximal jejunal angiodysplasia on angiography as a possible cause for OGIB. Eighteen patients did not experience recurrent GI bleeding and were treated symptomatically. A final diagnosis that could explain the source of the bleeding could not be achieved in this latter group of patients. The mean clinical follow-up of these patients was

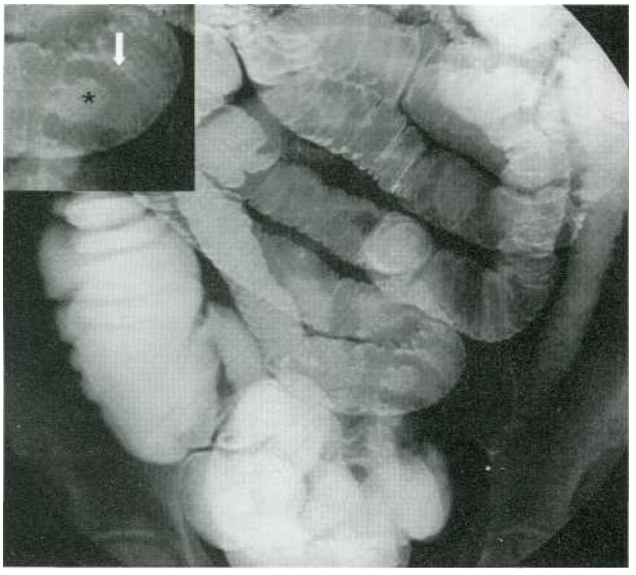

Figure 9. A 33-year-old man with inverted Meckel's diverticulum. Enteroclysis shows an intraluminal diverticular filling (*) surrounded by a thick radiolucent rim (white arrow) in the distal ileum (magnified view on the top)

34.2 months (range: 8 to 72 months).

Overall, on diagnostic radiologic work-up (EC and angiography) there were 35 cases in whom a specific pathology involving the small bowel was demonstrated. EC was successful in the detection of the possible source of bleeding in 29 cases (29/35, 82.8%) (Table 3).

DISCUSSION

The common causes for GI bleeding of small bowel origin are tumors of the small bowel (primary benign or malignant tumors, or metastatic lesions), angiodysplasia, inflammatory bowel disease, aortoenteric fistulas, and diverticula. The list of these different etiologies has shown wide variations in different studies (7-9). In common, among patients between 30 and 50 years of age, tumors are the most often encountered pathology. Among patients younger than 25, MeckeFs diverticulum is the most common source of bleeding in the small bowel, and in patients older than 50 years, vascular ectasias predominate (10). Radiologic and endoscopic techniques are far from perfect for evaluating and diagnosing OGIB of small bowel origin. However, if used rationally, endoscopic methods combined with other diagnostic methods (i.e. EC, angiography, scintigraphy) can identify a substantial number of bleeding causes and sites (11-12). As most enteroscopic procedures do not visualize the entire small bowel, radiologic visualization is almost mandatory and is best performed via EC. Small bowel follow-through examination is usually inadequate in the evaluation of small bowel diseases.

Small bowel enteroscopic examinations can be performed by four different techniques: push, sonde, intraoperative, and capsule enteroscopy (13-16). Each has its own advantages and limitations. Push enteroscopy is performed by an orally passed adult or pediatric colonoscope or special enteroscope that can be advanced beyond the ligament of Treitz. The diagnostic yield in this setting is as high as 40 to 50%, with angiodysplasia being the most commonly detected lesion (13-15). Push enteroscopy can give information only within the depth of insertion of the enteroscopic equipment, which ranges from 90 to 110 cm (17). More distal lesions cannot be evaluated by this technique

Table 1. Documentation of pathologies found on enteroclysis (Group 1)

Etiology	Number of cases	Percent	Diagnosis	Location		
				J	I	WSB
IBD	**18**	62%	Crohn's disease (34.4%)		10	
			Tuberculosis (20.6%)		6	
			Behcet's disease (3%)		1	
			Eosinophilic enteritis (3%)	1		
Neoplasia	**4**	13.7%	Leiomyosarcoma (3%)	1		
			Lymphoma (3%)	**1**		
			IPSID (3%)	1		
			Colon carcinoma metastasis (3%)		1	
Miscellaneous	**4**	13.7%	Inverted Meckel's diverticula (3%)		1	
			Jejunal diverticulosis (3%)	1		
			Peutz-Jeghers syndrome (3%)			1
			Postoperative adhesions (3%)	1		
Malabsorption	**3**	10.3%	Celiac disease (10.3%)	1		2
Total	**29**	100%		6	20	3

IBD: Inflammatory bowel disease; IPSID: Immunoproliferative small intestine disease; J: Jejunum; I: Ileum; WSB: Whole small bowel

Table 2. Documentation of cases in which a specific diagnosis could not be found on enteroclysis

Etiology	Diagnostic modality	Number of cases	Location
Hemorrhagic gastritis	Repeated upper GI endoscopy	5	Stomach
Duodenal erosions	Repeated upper GI endoscopy	4	Duodenum
Angiodysplasia	Angiography	6	Duodenum and jejunum
No pathology	Follow-up	18	

Table 3. Overall summary of obscure gastrointestinal bleeding

Examination	Number of pathologies
Enteroclysis	**29**
Repeated upper GI endoscopy	**9**
Angiography	**6**
No pathology	**18**
Total	**62**

which is its main limitation. On the other hand, sonde enteroscopy allows a view of the distal small bowel beyond the limit of push enteroscopy by using a long flexible fiberoptic enteroscope without controls, which is propelled passively by intestinal peristalsis (16). The endoscopic examination is performed during withdrawal of the instrument. Sonde enteroscopy may detect the site of small bowel blood loss in 33% of OGIB cases (16). Although the distal parts of the small bowel can be examined by this technique, patient discomfort and long duration of the examination are the main disadvantages. Exploratory surgery with intraoperative enteroscopy should be considered in patients with ongoing transfusion requirements, and in those under the age of 50 years to rule out a small bowel neoplasm (18). Although a high rate of site-specific sources can be obtained (approximately 70% of the patients), it is an operation-based invasive procedure (18). Wireless capsule endoscopy provides another means to visualize the small bowel. Experience with this approach is growing rapidly, but it has not yet been directly compared to other small bowel imaging methods in large studies including varied patient populations.

The first reports of EC in the diagnosis of OGIB came from Maglinte et al. (19). They identified 26 cases, mostly consisting of Meckel's diverticulum and primary and/or secondary tumors of the small bowel. Moch et al. (20) found lesions at EC in 32 out of 128 patients (25%). The lesions were mostly tumors of the small bowel. They used a modified technique, which better delineated the distal part of the duodenum and the duodenojejunal flexure. Rex et al. (21) reported a 10% diagnostic yield in 125 patients.

In our study, we detected small bowel pathologies in 82.8% (29/35) of the patients, which contradicts the literature. The discordance of our results may be explained by a number of factors: we performed this examination over a 10-year period and have seen a large variety of pathologies that gave us a considerable amount of experience. With use of the C-armed digital radiographic equipment the complication of the superpositioning of the long and folded small bowel is overcome. As EC is a real time study each small bowel segment could be carefully examined and, in addition, different images with different angles could be obtained. Another discordance lies in the pathologies that were detected by other authors. In the previous studies, the most frequent pathologies found were small bowel tumors (19-21). However, in our study we found predominantly inflammatory lesions at the distal ileum. This may be explained by regional factors; Crohn's disease, tuberculosis and Behcet's disease are more frequently seen in our country. Another point is that we deal with complicated and long-standing cases, as we are a tertiary center to which patients are referred. The major drawback of our study is that no angiodysplasia cases were detected by EC (6 cases); they were diagnosed by angiography. Angiodysplasias are flat submucosal lesions primarily located proximal to the Treitz ligament, and are therefore difficult to diagnose by EC (20). If we had performed the EC examination with the technique that Moch (20) had previously described, we might have detected some of these angiodysplasias. Another approach could have been the push enteroscopy. Nevertheless, a total of 29 of 35 cases overall of small bowel pathology were detected by EC.

In conclusion, EC provides essential information regarding the possible sources for OGIB of small bowel origin, thereby allowing the appropriate treatment to be instituted. When upper and lower GI endoscopic examinations are negative for identification of the source of OGIB, EC should be the next diagnostic method of choice. A carefully performed EC allows detection of many lesions in the

small bowel that cause GI bleeding. Thus we believe that it is the most useful and noninvasive imaging modality in the evaluation of the small bowel, especially in the evaluation of distal parts. Patients in whom EC did not yield a specific diagnosis should be followed-up. Recurrent and consistent GI bleeding should be considered an indication for further diagnostic evaluation, such as repeated endoscopic examinations, angiography and/or push enteroscopy.

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