

# Benign Small Bowel Ulcers: What Is the Most Common Cause?

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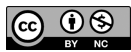
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## Abstract

**Objective:** Small bowel ulcers are rare. However, the diagnosis rates have increased with the introduction of capsule endoscopy into clinical use. Etiology includes infectious, inflammatory, malignant, and vasculitic diseases and drugs. The aim of this study is to evaluate the clinical features of patients with small bowel ulcers who have undergone CE for any reason.

**Methods:** The data of 178 cases who underwent capsule endoscopy in our clinic between 2005 and 2010 were analyzed retrospectively. Demographic and clinical features of cases with benign ulcers in the small intestine were evaluated. In patients with ulcers in the small intestine, either double balloon enteroscopy was performed or operated.

**Results:** A total of 24 patients (13.7%) had benign small bowel ulcers other than the bulbus. The mean age of the patients was  $45.2 \pm 19$  years (18-84) and 13 (54%) were male. The reasons for requesting capsule endoscopy were Crohn's disease suspicion in only 3, abdominal pain in 1, and bleeding of unknown origin in the others. The cause could not be determined in 9 patients (37.5%). Four of the patients were using acetylsalicylic acid and Coumadin due to ischemic heart disease. Four patients were diagnosed with Crohn's disease. Four patients were followed up with the diagnosis of nonspecific ulcer after surgery. One patient was operated for stenosis with the diagnosis of ulcerous jejunoileitis developed on the basis of gluten enteropathy. Although 1 patient did not use nonsteroidal anti-inflammatory drugs, he was diagnosed with diaphragm disease and followed up with biopsy material taken during double-balloon enteroscopy. Six (25%) patients who revealed multiple ulcers had Crohn disease or history of ASA. In 4 (16%) patients, stenosis developed due to ulceration in the small intestine.

**Conclusion:** In one-third of small bowel ulcers, the cause may not be determined. The most common etiologic causes are Crohn's disease and aspirin use, and ulcers are multiple in one-fourth of the patients.

**Keywords:** Capsule endoscopy, Crohn's disease, small bowel ulcer

## INTRODUCTION

Small bowel ulcers are generally rare; its incidence is approximately 40-50 per 100 000 patient-years. There is a slight preponderance in the young male population, with a median age at diagnosis of 50 years. The diagnosis is usually made when there are complications such as intestinal obstruction (50%), bleeding (22%), and perforation (10%), which are the general presentations of small intestinal ulcers.<sup>1</sup> Ulcers are usually located in the distal ileum, within 100 cm of the ileocecal valve.<sup>2</sup>

Capsule endoscopy (CE) is generally preferred as the first diagnostic test when small intestine examination is considered because it is noninvasive, is well tolerated, and can display the entire small intestine.<sup>3</sup> Capsule endoscopy is widely used in the evaluation of gastrointestinal bleeding, iron deficiency anemia, chronic abdominal pain and malabsorption syndromes such as suspected and known Crohn's disease and celiac disease.<sup>4</sup> With the introduction of CE into clinical use, the rate of diagnosis of small bowel ulcers has increased. Capsule endoscopy detect ulcers in smaller size in the small intestine compared to push enteroscopy and small bowel radiography.<sup>5-7</sup>

The most common causes of small bowel examination are chronic anemia, gastrointestinal bleeding, and chronic abdominal pain.<sup>8</sup> Approximately 5%-10% of patients with gastrointestinal bleeding do not have a defined source with a standard endoscopic and radiographic evaluation.<sup>9-12</sup> In approximately 75% of these patients, the source is in the small intestine.<sup>13-16</sup> The aim of this study is to evaluate the clinical features of patients with small bowel ulcers who have undergone CE for any reason.

## METHODS

The data of 176 cases who underwent CE in our clinic between 2005 and 2010 were analyzed retrospectively. Demographic and clinical features of cases with benign ulcers in the small intestine were evaluated.

The local ethics committee approved this retrospective study on March 9, 2013 (no. 2013/429-987), and all participants signed an informed consent form before the CE procedure.

Capsule endoscopy was performed with PillCam™. The review was analyzed by a single person (FA). An average of 14 hours of footage was taken.

In patients with ulcers in the small intestine, either double balloon enteroscopy was performed or operated. Kolmogorov–Smirnov ( $n > 50$ ) and skewness–kurtosis tests were used to check whether the continuous measurements in the study were normally distributed, and because the measurements were normally distributed, parametric tests were applied. Descriptive statistics for the variables in the study are expressed as mean, SD, minimum, maximum, number, and percent. The “independent *t*-test” was used to compare continuous measurements according to “categorical groups.” The chi-square test was used to determine the relationships between categorical variables. The statistical significance level was taken as 5% in the calculations, and the Statistical Package for Social Sciences (SPSS, IBM, Armonk, NY, USA) program was used for analysis.

## RESULTS

One hundred seventy-eight patients were included in the study. A total of 110 (61.8%) of the patients were male. The mean age of the patients was  $45.2 \pm 19$  years (18–84 years). While the rate of small bowel ulcer was 13.7%, the rate of extra-small bowel lesion was 10.1%. Table 1 shows the age distribution and ulcer rates of the patients.

Gastric transit time was  $42.07 \pm 52.82$  minutes, small intestine transit time was  $4.74 \pm 1.58$  hours, and all capsules reached the cecum. Gastric transit time in patients with and without small bowel ulcer, respectively, was  $71.83 \pm 100.72$  minutes and  $37.07 \pm 37.98$  minutes ( $P=.03$ ), and transit times were found to be  $4.86 \pm 1.07$  and  $4.73 \pm 1.61$  hours ( $P=.806$ ) in patients with and without ulcers, respectively. Table 1 shows the distribution of patients according to age groups and lesions detected in the small intestine.

The reasons for requesting CE were suspicion of Crohn’s disease in 3 patients, abdominal pain in 1 patient, and bleeding of unknown origin in the others. The cause could not be determined in 9 patients (37.5%). Four of the patients were using acetylsalicylic acid (ASA) and Coumadin due to ischemic heart disease. Four patients were diagnosed with Crohn’s disease. Four patients were followed up with the diagnosis of nonspecific ulcers after surgery. One patient was operated for stenosis with the diagnosis of ulcerous jejunoileitis developed on the basis of gluten enteropathy. Although there was no nonsteroidal anti-inflammatory drug (NSAID) use in 1 patient, he was diagnosed with diaphragm disease and followed up with biopsy material taken during DBE. Six (25%) patients with multiple ulcers had ASA use or Crohn’s

**Table 1.** Distribution of Patients According to Age Groups and Lesions Detected in the Small Intestine

		N	%
Age group	<70	135	75.8
	>70	43	24.2
Sex	Female	68	38.2
	Male	110	61.8
Small bowel ulcer	Absent	154	86.5
	Present	24	13.5
Nonsmall bowel lesion	SB lesion	124	89.9
	Non-SM lesion	14	10.1
Lesion localization	Proximal	36	26.3
	Middle	36	26.3
	Distal	29	21.2
	Jejunum + ileum	22	16.1
	Stomach	4	2.9
	Colon	6	4.4
	Choledoch	1	0.7
	Bulbus	3	2.2

SB: small bowel. Non-SB; non small bowel.

disease. In 4 (16%) patients, stenosis developed due to ulceration in the small intestine. In Table 2, ulcer etiologies of patients with small bowel ulcers are indicated.

Comorbidity was found in 33.1% of the patients included in the study (Figure 1).

When comparing the patients with inflammatory bowel (IB) ulcer detected in CE and those who were not detected in terms of age, gender, obscure bleeding status, presence of portal hypertension (PHT), comorbidity status, diagnosis that constitutes an indication for CE, and presence of active blood, a statistically significant correlation was observed between the age distribution of the patients and the presence of small bowel ulcers ( $P < .05$ ), and more small bowel ulcers were found in people under the age of 70 years. Similarly, small bowel ulcers were not detected in any of the 25 patients with PHT findings ( $P < .05$ ). Table 3 shows the comparison of the variables according to the small bowel ulcer status of the patients.

## DISCUSSION

Small bowel ulcers are often associated with inflammatory bowel disease, especially Crohn’s disease, but many etiologies should be considered in the differential diagnosis.<sup>17</sup> These include the toxic effects of drugs such as NSAIDs, minor nonspecific inflammatory conditions, infections, systemic or vascular diseases, and genetic diseases. Neither endoscopic images containing scoring systems nor inflammatory markers such as fecal calprotectin are specific for diagnosis.<sup>18–20</sup> Histology may provide a diagnostic clue but not always definitively. Therefore,

**Table 2.** Ulcer Etiology in Patients with Small Bowel Ulcers

	N	%
Nonspecific with surgery	4	16.7
Acetylsalicylic acid–Coumadin	4	16.7
Amyloidosis	1	4.2
Crohn’s disease	4	16.7
Ulcerative jejunoileitis	1	4.2
Diaphragm—idiopathic	1	4.2
Cause unknown	9	37.5

## MAIN POINTS

- Capsule endoscopy is beneficial to evaluate the etiology of small bowel ulcers.
- Most common etiologies of benign small bowel ulcers were related to drug and Crohn’s disease.
- Despite all investigations, in one-third of the small bowel ulcers, the cause may remain undetermined.

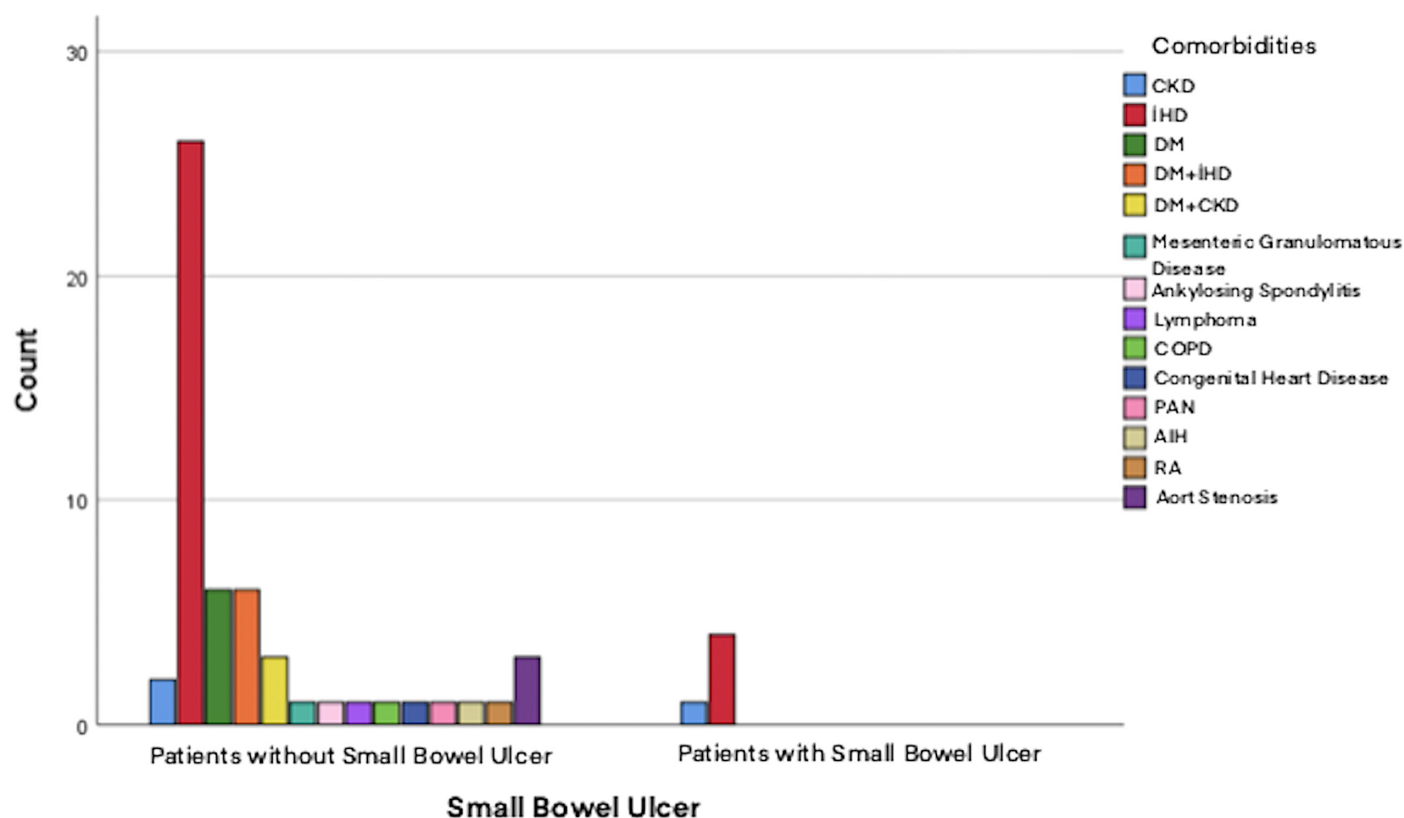


Figure 1. Comorbidity status of the patients.

demographics, clinical presentation, imaging, laboratory tests, and follow-up should also be considered.

This study showed that Crohn's disease and NSAIDs are the most common causes of benign small bowel ulcers. In our study, IB ulcers detected in Crohn's patients were mostly seen in the ileum, while NSAID-associated ulcers were seen in both jejunum and ileum at the same rate. Table 4 shows the localization and percentage of small bowel ulcers due to Crohn's disease and NSAIDs.

According to current European Crohn's and Colitis Organization—the European Society of Gastrointestinal and Abdominal Radiology guidelines, the presence of at least 3 small intestinal ulcers in the absence of NSAIDs for at least 1 month in small bowel CE is considered highly suggestive of Crohn's disease.<sup>21</sup> Young age and presentation with abdominal pain may be clues to Crohn's disease. In our study, the most common cause of small bowel ulcers was found to be Crohn's disease with 16.7%. This rate was found to be 22.2% in the study by Teramoto-Matsubara et al and 38.9% in the study by Keil Rios et al.<sup>22,23</sup> The reason for the lower rate of small bowel ulcers in our study compared to these 2 studies was related to the fact that the indication rates for CE were different, and the other was related to the fact that malignant ulcers and bulbus ulcers were not included in our study.

The major differential diagnosis in small bowel ulcers is between Crohn's disease and NSAIDs. In our study, as in the literature, the most common etiologic causes were Crohn's disease and NSAID use. In the study of Sorrentino et al<sup>24</sup> on the etiology of small bowel ulcers, the frequency of NSAID-related ulcers was found to be 11%, similar to

our study. It is not possible to distinguish between Crohn's disease-related ulcers and drug-associated ulcers by endoscopic appearance alone. Localization and number may help for the difference. Therefore, in the presence of anamnesis and drug suspicion, discontinuation of the drug and repeating the imaging may be guiding in terms of the etiology of small bowel ulcers.<sup>24</sup> In addition, the presentation patterns of the patients may also be guiding in terms of the etiology of small bowel ulcers. Keuchel et al<sup>25</sup> reported that bleeding is more common in NSAID enteropathy, and patients with ulcers due to Crohn's disease mostly complain of abdominal pain. On the other hand, the increased incidence of small bowel ulcers due to drug use in young patients with Crohn's disease was also in line with the findings in this article.<sup>25</sup> Small intestinal ulcers presenting with bleeding and advanced age seem to be due to NSAID-associated enteropathy more frequently than small intestinal ulcers presenting at younger ages and with abdominal pain.<sup>26</sup>

NSAID enteropathy is the most common cause of drug-associated small bowel ulcers. Small-sized ulcers and accompanying erosions are seen in the distal small intestine more frequently than in Crohn's disease, a history of bleeding is more frequent, and healing with discontinuation of NSAID medication and accompanying web-like strictures may also support the diagnosis. In chronic NSAID use, the frequency of gastroduodenal ulcer was 20%, while the frequency of small intestinal ulcer was 8%. Epidemiological data have found that NSAID use is associated with a high risk of small bowel perforation and stricture formation in enteropathy.<sup>27-31</sup>

The most common causes of small bowel examination are chronic iron deficiency anemia, gastrointestinal bleeding, and chronic abdominal

**Table 3.** Comparison of Patients' Characteristics According to Small Bowel Ulcer Status

		SB Ulcer Absent			SB Ulcer Present			P*		
		N	Line %	Column %	N	Line %	Column %			
Age group	<70	112	83.0	72.7	23	17.0	95.8	<b>.014,</b> <b>.033</b>		
	>70	42	97.7	27.3	1	2.3	4.2			
Sex	Female	57	83.8	37.0	11	16.2	45.8	.408		
	Male	97	88.2	63.0	13	11.8	54.2			
Obscure bleeding	Obscure bleeding	121	85.8	78.6	20	14.2	83.3	.593		
	Other reasons (PHT, protein loss)	33	89.2	21.4	4	10.8	16.7			
According to PHT presence	PHT	25	100.0	16.2	0	0.0	0.0	<b>.033</b>		
	Other	129	84.3	83.8	24	15.7	100.0			
According to the presence of comorbidity	Absent	100	84.0	64.9	19	16.0	79.2	.168		
	Present	54	91.5	35.1	5	8.5	20.8			
Comorbid disease status	CRF	2	66.7	3.7	1	33.3	20.0	.956		
	IHF	26	86.7	48.1	4	13.3	80.0			
	DM	6	100.0	11.1	0	0.0	0.0			
	DM+IHF	6	100.0	11.1	0	0.0	0.0			
	DM+CRF	3	100.0	5.6	0	0.0	0.0			
	Mesenteric granulomatosis disease	1	100.0	1.9	0	0.0	0.0			
	Ankylosing spondylitis	1	100.0	1.9	0	0.0	0.0			
	Lymphoma	1	100.0	1.9	0	0.0	0.0			
	COPD	1	100.0	1.9	0	0.0	0.0			
	Congenital heart disease	1	100.0	1.9	0	0.0	0.0			
	PAN	1	100.0	1.9	0	0.0	0.0			
	OIH	1	100.0	1.9	0	0.0	0.0			
	RA	1	100.0	1.9	0	0.0	0.0			
	Aortic stenosis	3	100.0	5.6	0	0.0	0.0			
	Diagnosis	Obvious—obscure	80	85.1	51.9	14	14.9		58.3	.199
		Occult—obscure	20	87.0	13.0	3	13.0		12.5	
Anemia		41	93.2	26.6	3	6.8	12.5			
Stomach polyp—hamartomatous		2	100.0	1.3	0	0.0	0.0			
Crohn's disease		5	62.5	3.2	3	37.5	12.5			
Polyposis coli		1	100.0	0.6	0	0.0	0.0			
Carcinoid		1	100.0	0.6	0	0.0	0.0			
Operated—Crohn—anemia		1	100.0	0.6	0	0.0	0.0			
Protein losing enteropathy		2	100.0	1.3	0	0.0	0.0			
Exudate ascite—small bowel thickening		1	100.0	0.6	0	0.0	0.0			
Abdominal pain		0	0.0	0.0	1	100.0	4.2			
Active bleeding		Absent	126	85.1	83.4	22	14.9	91.7	.300	
		Present	25	92.6	16.6	2	7.4	8.3		

Note: COPD, chronic obstructive pulmonary disease; DM, diabetes mellitus; PAN, polyarteritis nodosa; PHT, portal hypertension; RA, rheumatoid arthritis; SB, small bowel; CRF, chronic renal failure; IHF, ischemic heart failure; AIH, autoimmune hepatitis.

pain. In the study by Blanco-Velasco et al.<sup>32</sup> the reasons for requesting CE were, in order of frequency, similar to our study, bleeding of unknown cause, neoplasia, and Crohn's disease.

As a conclusion, the major differential diagnosis in small intestinal ulcers is between Crohn's disease and NSAIDs, so drug history is very

**Table 4.** Localization and Percentage of Small Bowel Ulcers due to Crohn's Disease and NSAID

Localization of Small Bowel Ulcers	NSAID	Crohn's Disease
Proximal ileum	None	25%
Mid ileum	25%	25%
Distal ileum	50%	25%
Ileal+Jejunal	25%	25%

NSAID, nonsteroidal anti-inflammatory drug.

important in diagnosis. The endoscopic view is often nonspecific, and localization may be helpful. Histology is essential as it can provide a diagnostic clue; but in most cases, it remains a piece of the puzzle. Other causes of small bowel ulcers are numerous but rarely seen on a case-by-case basis. In this current study, as in similar studies, the cause may not be detected in approximately one-third of small intestinal ulcers, despite the tests performed. Further laboratory, microbiological, and even genetic testing may be helpful to reach a diagnosis.

**Ethics Committee Approval:** Ethical committee approval was received from the Ethics Committee of Istanbul University Faculty of Medicine (Date: March 9, 2013, Decision No: 2013/429-987).

**Informed Consent:** Written informed consent was obtained from all participants who participated in this study.

**Peer-review:** Externally peer-reviewed.

**Author Contributions:** Concept – V.S., A.Ç.Ö.; Design – B.Ç.; Supervision – F.A.; Resources – B.P., Ü.A.; Materials – Ö.S.; Data Collection and/or Processing – Ç.K., K.D.; Analysis and/or Interpretation – S.Ö., F.B.; Literature Search – G.B., S.K., Z.M.; Writing Manuscript – V.S., B.Ç.; Critical Review – F.A.

**Declaration of Interests:** The authors have no conflicts of interest to declare.

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## REFERENCES

- Karnam US, Rosen CM, Raskin JB. Small bowel ulcers. *Curr Treat Options Gastroenterol*. 2001;4(1):15-21. [\[CrossRef\]](#)
- Boydston JS Jr, Gaffey TA, Bartholomew LG. Clinicopathologic study of nonspecific ulcers of the small intestine. *Dig Dis Sci*. 1981;26(10):911-916. [\[CrossRef\]](#)
- Westerhof J, Weersma RK, Koornstra JJ. Investigating obscure gastrointestinal bleeding: capsule endoscopy or double balloon enteroscopy? *Neth J Med*. 2009; 67(7):260-265.
- Mishkin DS, Chuttani R, Croffie J, et al. ASGE technology status evaluation report: wireless capsule endoscopy. *Gastrointest Endosc*. 2006;63(4):539-545. [\[CrossRef\]](#)
- Remke S, Helou L, Mayer G, et al. Wireless capsule endoscopy and push-enteroscopy in chronic gastrointestinal bleeding: A prospective controlled trial. *Gastrointest Endosc*. 2002;55:AB125.
- Pennazio M, Santucci R, Rondonotti E, et al. Wireless capsule endoscopy in patients with obscure gastrointestinal bleeding: results of the Italian multicenter experience. *Gastrointest Endosc*. 2002;55:AB87.
- Costamagna G, Riccioni ME, Foschia F, et al. Use of a duodenoscope to manage complications at the ureteroileal anastomotic site after total urinary bladder resection and the Bricker procedure. *Gastrointest Endosc*. 2002;55(2):242-248. [\[CrossRef\]](#)
- Liangpunsakul S, Chadalawada V, Rex DK, Maglinte D, Lappas J. Wireless capsule endoscopy detects small bowel ulcers in patients with normal results from state of the art enteroclysis. *Am J Gastroenterol*. 2003;98(6):1295-1298. [\[CrossRef\]](#)
- Chetcuti Zammit S, McAlindon ME, Hale MF, et al. Small bowel ulcers on capsule endoscopy and their significance. *Inflamm Bowel Dis*. 2019; 25(5):e55. [\[CrossRef\]](#)
- Maiden L, Thjodleifsson B, Theodors A, Gonzalez J, Bjarnason I. A quantitative analysis of NSAID induced small bowel pathology by capsule endoscopy. *Gastroenterology*. 2005;128(5):1172-1178. [\[CrossRef\]](#)
- Teng X, Gao C, Sun M, Wu J. Clinical significance of fecal calprotectin for the early diagnosis of abdominal type of Henoch-Schonlein purpura in children. *Clin Rheumatol*. 2018;37(6):1667-1673. [\[CrossRef\]](#)
- Chao CY, Duchatellier CF, Seidman EG. Unsuspected small-bowel Crohn's disease in elderly patients diagnosed by video capsule endoscopy. *Diagn Ther Endosc*. 2018;2018:9416483. [\[CrossRef\]](#)
- Maaser C, Sturm A, Vavricka SR, et al. ECCO-ESGAR Guideline for Diagnostic Assessment in IBD Part 1: Initial diagnosis, monitoring of known IBD, detection of complications. *J Crohns Colitis*. 2019;13(2):144-164. [\[CrossRef\]](#)
- Gerson LB, Fidler JL, Cave DR, Leighton JA. ACG clinical guideline: diagnosis and management of small bowel bleeding. *Am J Gastroenterol*. 2015;110(9):1265-1288. [\[CrossRef\]](#)
- Pennazio M, Spada C, Eliakim R, et al. Small-bowel capsule endoscopy and device-assisted enteroscopy for diagnosis and treatment of small-bowel disorders: European Society of Gastrointestinal Endoscopy (ESGE) Clinical Guideline. *Endoscopy*. 2015;47(4):352-376. [\[CrossRef\]](#)
- Yamamoto H, Ogata H, Matsumoto T, et al. Clinical practice guideline for enteroscopy. *Dig Endosc*. 2017;29(5):519-546. [\[CrossRef\]](#)
- Szold A, Katz LB, Lewis BS. Surgical approach to occult gastrointestinal bleeding. *Am J Surg*. 1992;163(1):90-92. [\[CrossRef\]](#)
- Tee HP, Kaffes AJ. Non-small-bowel lesions encountered during double-balloon enteroscopy performed for obscure gastrointestinal bleeding. *World J Gastroenterol*. 2010;16(15):1885-1889. [\[CrossRef\]](#)
- Pennazio M, Arrigoni A, Risio M, Spandre M, Rossini FP. Clinical evaluation of push-type enteroscopy. *Endoscopy*. 1995;27(2):164-170. [\[CrossRef\]](#)
- Chong J, Tagle M, Barkin JS, Reiner DK. Small bowel push-type fiberoptic enteroscopy for patients with occult gastrointestinal bleeding or suspected small bowel pathology. *Am J Gastroenterol*. 1994;89(12):2143-2146.
- Davies GR, Benson MJ, Gertner DJ, Van Someren RM, Rampton DS, Swain CP. Diagnostic and therapeutic push type enteroscopy in clinical use. *Gut*. 1995;37(3):346-352. [\[CrossRef\]](#)
- Teramoto Matsubara O, Zamarripa Dorsey F, López Acosta ME. Capsule endoscopy: the evolution in the diagnosis of small bowel diseases. *Rev Gastroenterol Mex*. 2005;70(2):138-142.
- Keil-Ríos D, Angulo-Molina D, Peláez-Luna M, Farca-Belsaguy A. Mexico Capsule Endoscopy for the Study of Small Bowel Disorders: Experience at a Private Institution in Mexico *Revista de Gastroenterología de México. Estradas-Trujillo Unidad de Endoscopia Avanzada, Centro Médico ABC, Mexico City*; 2019, 85(3):240-245.
- Sorrentino D, Nguyen VQ. Clinically significant small bowel Crohn's disease might only be detected by capsule endoscopy. *Inflamm Bowel Dis*. 2018;24(7):1566-1574. [\[CrossRef\]](#)
- Keuchel M, Kurniawan N, Baltes P. Small bowel ulcers: When is it not inflammatory bowel disease? *Curr Opin Gastroenterol*. 2019;35(3):213-222. [\[CrossRef\]](#)
- Bjarnason I, Hayllar J, Macpherson AJ, Russell AS. Side effects of non-steroidal anti-inflammatory drugs on the small and large intestine in humans. *Gastroenterology*. 1993;104(6):1832-1847. [\[CrossRef\]](#)
- Lang J, Price AB, Levi AJ, Burke M, Gumpel JM, Bjarnason I. Diaphragm disease: pathology of disease of the small intestine induced by non-steroidal anti-inflammatory drugs. *J Clin Pathol*. 1988;41(5):516-526. [\[CrossRef\]](#)
- Bjarnason I, Fehilly B, Smethurst P, Menzies IS, Levi AJ. Importance of local versus systemic effects of non-steroidal anti-inflammatory drugs in increasing small intestinal permeability in man. *Gut*. 1991;32(3):275-277. [\[CrossRef\]](#)
- Aabakken L. Small-bowel side-effects of non-steroidal anti-inflammatory drugs. *Eur J Gastroenterol Hepatol*. 1999;11(4):383-388. [\[CrossRef\]](#)
- Schneider ARJ, Benz C, Riemann JF. Adverse effects of nonsteroidal anti-inflammatory drugs on the small and large bowel. *Endoscopy*. 1999;31(9):761-767. [\[CrossRef\]](#)
- Teramoto Matsubara O, Zamarripa Dorsey F, López Acosta ME. Capsule endoscopy: the evolution in the diagnosis of small bowel diseases. *Rev Gastroenterol Mex*. 2005;70(2):138-142.
- Blanco-Velasco G, Mendoza-Segura C, Solórzano-Pineda OM, Hernández-Mondragón OV, Paz-Flores V, Blancas-Valencia JM. Indicaciones, Rendimiento Diagnóstico y Seguridad de la Cápsula Endoscópica de Intestino Delgado en Pacientes Mexicanos. Experiencia de un Centro de Tercer nivel. *Rev Gastroenterología Mex*. 2020;85(2):140-144. [\[CrossRef\]](#)