

Retrospective Study

What is the impact of capsule endoscopy in the long term period?

Asli Ormeci, Filiz Akyuz, Bulent Baran, Suut Gokturk, Tugrul Ormeci, Binnur Pinarbasi, Ozlem Mutluay Soyer, Sami Evirgen, Umit Akyuz, Cetin Karaca, Kadir Demir, Sabahattin Kaymakoglu, Fatih Besisik

Asli Ormeci, Filiz Akyuz, Bulent Baran, Suut Gokturk, Binnur Pinarbasi, Ozlem Mutluay Soyer, Sami Evirgen, Cetin Karaca, Kadir Demir, Sabahattin Kaymakoglu, Fatih Besisik, Division of Gastroenterohepatology, Department of Internal Medicine, Istanbul Faculty of Medicine, Istanbul University, 34590 Capa, Istanbul, Turkey

Tugrul Ormeci, Department of Radiology, Medipol University, 34214 Bagecilar, Istanbul, Turkey

Umit Akyuz, Department of Gastroenterology, Yeditepe University, 34752 Kozyatagi, Istanbul, Turkey

Author contributions: Akyuz F evaluated the recorded capsule endoscopy images; Ormeci A and Akyuz F collected the clinical data and wrote the manuscript, with contributions from Gokturk S, Pinarbasi B, Soyer OM, Evirgen S, Akyuz U and was responsible for the design of the study and collected the clinical data; Passage opening was evaluated with computerized tomography from Ormeci T; Akyuz F and Baran B performed the statistical analyses; Karaca C, Demir K, Kaymakoglu S and Besisik F participated in the design and coordination of the study; all authors read and approved the final manuscript.

Institutional review board statement: This study was reviewed and approved by the Ethics Committee of the Istanbul University, Istanbul Medical Faculty.

Informed consent statement: All patients provided written consent to undergo capsule endoscopy. All data are anonymized and there were no prospective interventions.

Conflict-of-interest statement: We have no financial relationships to disclose.

Data sharing statement: Technical appendix, statistical code, and dataset available from the corresponding author at filizakyuz@hotmail.com.

Open-Access: This article is an open-access article which was selected by an in-house editor and fully peer-reviewed by external reviewers. It is distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license,

which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited and the use is non-commercial. See: <http://creativecommons.org/licenses/by-nc/4.0/>

Correspondence to: Dr. Filiz Akyuz, Professor, Division of Gastroenterohepatology, Department of Internal Medicine, Istanbul Faculty of Medicine, Istanbul University, Turgut Ozal Millet St., Fatih, 34590 Capa, Istanbul, Turkey. filizakyuz@hotmail.com
Telephone: +90-212-4142000
Fax: +90-212-6319743

Received: June 19, 2015
Peer-review started: June 20, 2015
First decision: July 27, 2015
Revised: October 12, 2015
Accepted: January 27, 2016
Article in press: January 29, 2016
Published online: April 10, 2016

Abstract

AIM: To assess the clinical impact of capsule endoscopy (CE) in the long-term follow-up period in patients with obscure gastrointestinal bleeding (OGIB).

METHODS: One hundred and forty-one patients who applied CE for OGIB between 2009 and 2012 were retrospectively analyzed, and this cohort was then questioned prospectively. Demographic data of the patients were determined *via* the presence of comorbid diseases, use of non-steroidal anti-inflammatory drugs anticoagulant-antiaggregant agents, previous diagnostic tests for bleeding episodes, CE findings, laboratory tests and outcomes.

RESULTS: CE was performed on 141 patients because

of OGIB. The capsule was retained in the upper gastrointestinal (GI) system in two of the patients, thus video monitoring was not achieved. There were 139 patients [62% male, median age: 72 years (range: 13-93 years) and a median follow-up duration: 32 mo (range: 6-82 mo)]. The overall diagnostic yield of CE was 84.9%. Rebleeding was determined in 40.3% (56/139) of the patients. The rebleeding rates of patients with positive and negative capsule results at the end of the follow-up were 46.6% (55/118) and 4.8% (1/21), respectively. In the multivariate analysis, usage of NSAIDs, anticoagulant-antiaggregant therapies (OR = 5.8; 95%CI: 1.86-18.27) and vascular ectasia (OR = 6.02; 95%CI: 2.568-14.146) in CE were detected as independent predictors of rebleeding. In the univariate analysis, advanced age, comorbidity, and overt bleeding were detected as predictors of rebleeding.

CONCLUSION: CE is a reliable method in the diagnosis of obscure GI bleeding. Negative CE correlated with a significantly lower rebleeding risk in the long-term follow-up period.

Key words: Capsule endoscopy; Small bowel; Obscure gastrointestinal bleeding; Rebleeding

© **The Author(s) 2016.** Published by Baishideng Publishing Group Inc. All rights reserved.

Core tip: This study determines the results of using capsule endoscopy in obscure gastrointestinal bleeding in long-term. Our main aim was to describe the long-term clinical impact of capsule endoscopy during follow-up period. Positive capsule endoscopy results correlated with higher rebleeding rates. Independent predictors of rebleeding were detected to be usage of non-steroidal anti-inflammatory drugs, anticoagulant/antiaggregant therapy and vascular ectasia.

Ormeçi A, Akyuz F, Baran B, Gokturk S, Ormeçi T, Pinarbasi B, Soyer OM, Evirgen S, Akyuz U, Karaca C, Demir K, Kaymakoglu S, Besisik F. What is the impact of capsule endoscopy in the long term period? *World J Gastrointest Endosc* 2016; 8(7): 344-348 Available from: URL: <http://www.wjgnet.com/1948-5190/full/v8/i7/344.htm> DOI: <http://dx.doi.org/10.4253/wjge.v8.i7.344>

INTRODUCTION

Obscure gastrointestinal bleeding (OGIB) is a frequent problem in the daily gastroenterology practice that represents nearly 5% of all gastrointestinal (GI) hemorrhages^[1-3]. The most extensive location of OGIB is small bowel, where it is usually far beyond the range of a standard endoscopic examination. Therefore, capsule endoscopy (CE) is the preferred technique to assess patients with OGIB^[4-6]. The high specificity and sensitivity of CE in OGIB cases and increased diagnostic value of this method was shown in several previously published

studies. Even though diagnostic value of CE is the focus point of most studies, in the literature there is not enough data about the long-term results of using CE and its effectiveness in predicting and assessment of rebleeding risks. In this study, our main aim was to determine the long-term clinical impact of capsule endoscopy during follow-up period.

MATERIALS AND METHODS

Patients

The data obtained from the patients presented to gastroenterology department and referred to endoscopy unit with OGIB from January 2009 to December 2012 was analyzed in a retrospective design. This cohort was then questioned prospectively.

Before the CE procedure, all of the patients were applied colonoscopy and upper GI endoscopy (GIE) in our endoscopy unit. The collected data from the patients included their demographics, previous intake of anticoagulant/antiaggregant therapy, non-steroidal anti-inflammatory drugs (NSAIDs), present comorbidities, their previous diagnostic test results [upper GIE, colonoscopy, radiological studies of small bowel, computerized tomography (CT) imaging], CE findings and follow-up data.

Before the CE procedure, the passage opening was evaluated using CT. CE was not undertaken in patients who had strictures or obstructions.

The study was done after the patients were informed about this study and the patients' written informed consents were taken according to Helsinki Declaration. The study was obtained from local ethics committee.

CE procedure

CE procedures were performed on an outpatient basis without hospitalization. Pillcam SB2 (Given Imaging, Yoqneam, Israel) was used for the procedure. Patients' bowel preparation was done using 4 L polyethylene glycol solution one day before the procedure. The patients swallowed the capsules (Pillcam SB2) in the outpatient clinic. Fluid intake was permitted 2 h and eating was allowed 4 h after the initial administration of capsules. Patients were instructed to check their stool for the ejection of capsule and to notify the endoscopy unit if it was not ejected. Failure of the capsule ejection in more than 2 wk was defined as capsule retention in the GI tract. One gastroenterologist (F-A) with extensive experience in small bowel endoscopy evaluated the recorded CE images.

Follow-up

Charts were used to gather full follow-up information including OGIB recurrence and CE complications. Each patient was called and reevaluated for the follow-up results. The period between the initial CE and last recorded follow-up appointment was defined as follow-up period. Overt bleeding or the decrease in Hb levels >

Table 1 Capsule endoscopy findings in patients with obscure gastrointestinal bleeding

Findings	n (%)
Positive findings in CE	118 (84.9)
Normal	21 (15.1)
Angiodysplasia	27 (19.42)
Polypoid lesion	25 (17.98)
Ulcer	25 (17.98)
Erosions	22 (15.82)
Malign lesions	7 (5.12)
Active bleeding	4 (2.87)
Portal hypertensive enteropathy	2 (1.43)
Mucosal bleeding	2 (1.43)
Arteriovenous malformation	2 (1.43)
Diverticulum	1 (0.71)
Parasite infection	1 (0.71)

CE: Capsule endoscopy.

2 g/dL were considered as "rebleeding".

Statistical analysis

Statistical analysis was performed using Number Cruncher Statistical System 2007 with Power Analysis and Sample Size 2008 statistical software. The data was analyzed by definitive methods (mean, standard deviation, median, minimum, maximum, frequency, ratio,) together with Pearson's χ^2 test, Fisher-Freeman-Halton test, Yates's Continuity Correction test. In the determination of multivariate effects of the variables on rebleeding, Stepwise logistic regression analysis was used. Significance levels were determined as $P < 0.01$ and $P < 0.05$.

RESULTS

CE was performed on 141 patients with OGIB. The capsule was retained in the upper GI tract in two patients thus video monitoring was not achieved. The first patient was diagnosed as having achalasia after CE, and the second had gastric diabetic gastroparesis by further investigation. A total of 139 patients (62% male) who applied CE had available follow-up data. Median age of patients was 72 years (13-93) and median follow-up duration was 32 mo (6-82 mo). In 112 of the 139 (80.6%) patients, capsule transit time to caecum was within the recording time. Spontaneous elimination of the capsule within 2 wk was seen in 133 (95.4%) patients. Capsule retention was found in 6 patients (4.6%). The overt obscure bleeding rate was 61.9% ($n = 86$), whereas the rate for occult obscure bleeding was 38.1% ($n = 53$). Comorbidities were detected in 35.5% ($n = 50$) of the patients. NSAIDs, anticoagulant-antiaggregant drugs were used at a rate of 18.9% ($n = 26$). CE was positive in 118 (84.9%) patients (Table 1).

Long-term outcome of CE

Rebleeding was seen in 40.3% of the patients (26.4% occult and 48.8% overt bleeding, $P = 0.015$). The rebleeding rate was 46.6% (55/118) in patients with positive CE

Table 2 Evaluation of rebleeding according to the demographic data n (%)

	Rebleeding		P
	(+)	(-)	
Age, n (%)			
< 70 yr	32 (32)	68 (68)	¹ 0.001 ^b
> 70 yr	24 (61.5)	15 (38.5)	
Comorbidity	33 (66)	17 (34)	² 0.001 ^b
OGIB			
Overt	42 (48.8)	44 (51.2)	² 0.015 ^a
Occult	14 (26.4)	39 (73.6)	
Vascular lesion	31 (72.1)	12 (27.9)	² 0.001 ^b
Positive capsule result	55 (46.6)	63 (53.4)	² 0.001 ^b
NSAIDs-anticoagulant antiaggregant therapy	19 (73.1)	7 (26.9)	² 0.001 ^b

¹Pearson Ki-kare test; ²Yates' Continuity Correction test. ^a $P < 0.05$; ^b $P < 0.01$. OGIB: Obscure gastrointestinal bleeding; NSAIDs: Non-steroidal anti-inflammatory drugs.

and 4.8% (1/21) with negative CE results at the end of follow-up period. Evaluation of rebleeding in relation with the demographic data is shown in Table 2. Both univariate and multivariate analyses were performed to find out the factors related with a higher risk of rebleeding. When we evaluated the effects of comorbidity, age, overt presentation, NSAIDs-anticoagulant-antiaggregant therapy and vascular lesion on rebleeding by stepwise logistic regression analysis, the OR for the effect of NSAIDs-anticoagulant-antiaggregant therapy on rebleeding was 5.8 (95%CI: 1.86-18.27), and 6.027 (95%CI: 2.56-14.14) for vascular lesions. Although, OR was 2.274 (95%CI: 0.86-5.98) for comorbidities, it was not statistically significant. The association analysis is detailed in Table 3. One patient who had diverticulosis coli and negative CE died because of bleeding at 46 mo. The specificity of the CE was found to be 95.2% and positive predictive value was 98.2% in the prediction of rebleeding. Treatment was applied to 29 patients (51.7%): Surgery ($n = 4$), argon plasma coagulation ($n = 11$), transcatheter aortic valve implantation (TAVI) (the reason of the bleeding was aortic stenosis so to treat that TAVI procedure was applied) ($n = 2$), hormonal therapy ($n = 2$), reason based treatment (NSAIDs, anticoagulant, antiplatelet, antiaggregant drugs withdrawal) ($n = 10$). Seven patients died at the end of the follow-up and six of them died because of a rebleeding episode.

DISCUSSION

For the diagnosis of OGIB, capsule endoscopy is a useful imaging technique. Therefore, it is accepted as a gold standard method and should be the first step in the management of patients with OGIB^[7]. The number of studies about the results of CE in long-term is limited^[8-10]. In this study, we assessed the impact of CE in the long-term period (median: 32 mo) in patients with OGIB. The diagnostic yield of CE was 84.9%. Rebleeding was determined in 40.3% (56/139) in patients with OGIB. Specificity of CE was 95.2% and positive predictive value for rebleeding was 98.2%. Previous studies in the

Table 3 Risk factors for rebleeding (univariate-multivariate analysis)

	Univariate			Multivariate		
	OR	95%CI	P	OR	95%CI	P
Comorbidity	5.176	2.442-10.972	0.001 ^b	2.274	0.864-5.986	0.096
Age	3.400	1.574-7.342	0.001 ^b	1.735	0.595-5.057	0.313
Overt OGIB	2.659	1.265-5.589	0.015 ^a	1.222	0.490-3.048	0.667
NSAIDs-anticoagulant-antiagregant therapy	5.575	2.153-14.438	0.001 ^b	5.843	1.868-18.275	0.002 ^b
Vascular lesion	6.458	2.852-14.625	0.001 ^b	6.027	2.568-14.146	0.001 ^b
Positive CE results	17.460	2.269-134.371	0.001 ^b	-	-	-

^aP < 0.05; ^bP < 0.01. OGIB: Obscure gastrointestinal bleeding; NSAIDs: Non-steroidal anti-inflammatory drugs; CE: Capsule endoscopy.

Table 4 Rebleeding rates in different studies

Ref.	Total number of case	Follow-up duration (mo)	Rebleeding rates after negative CE (%)
Lai <i>et al</i> ^[11]	49	12	6
Macdonald <i>et al</i> ^[12]	49	17	11
Park <i>et al</i> ^[13]	51	32	36
Delvaux <i>et al</i> ^[14]	44	12	0
Iwamoto <i>et al</i> ^[16]	78	6	4
Lorenceanu-Savale <i>et al</i> ^[17]	35	12	0
Koh <i>et al</i> ^[18]	51	23	23

CE: Capsule endoscopy.

literature reported lower bleeding ratios in patients with negative CE results in comparison with positive^[11-13]. Delvaux *et al*^[14]'s study on 44 patients in one-year follow-up period reported that the negative predictive values was 100% in patients with negative CE and the positive predictive values of CE were 94.4% in patients with positive CE results. Arakawa *et al*^[15] also reported that none of their patients who had a normal CE had rebleeding. As compatible with the literature, only one patient has a rebleed who had a normal CE in our group. The follow-up time is important for patients who have negative CE. In our study, the mean follow-up duration for patients was 46 ± 21 mo (range: 6-82 mo). The rebleeding rate is variable in the literature (0%-36%, Table 4)^[11-14,16-18]. However, the main restriction of these studies is the small group of patients and their relatively short follow-up periods. Rahmi *et al*^[19] showed that overt OGIB at presentation was a risk factor for rebleeding. We also found that the rebleeding ratio was higher in overt obscure bleeding when compared with occult obscure bleeding (48.8% vs 26.4%, P = 0.015). Vascular lesions were more susceptible to rebleeding when it was compared with the others (72.1% vs 27.9%, P = 0.001). These results also confirm the results of previous studies^[20,21]. In present study, NSAIDs-anticoagulant-antiagregant therapy (OR = 5.8; 95%CI: 1.86-18.27) and vascular ectasia (OR= 6.02; 95%CI: 2.568-14.146) were detected as an independent risk factors for rebleeding in the multivariate analysis. In univariate analysis; advanced age, comorbidity, overt bleeding, were also detected as a predictors of rebleeding. Therefore, anticoagulant/antiagregant/NSAIDs users, and vascular lesions in CE should be follow-up carefully because of the high rebleeding rate. Our long-term follow-up results

were compatible with the short-term follow-up results in the literature^[20-23].

In conclusion, CE is a reliable method in the diagnosis of obscure GI bleeding. Negative CE correlated with a significantly lower rebleeding risk in the long-term follow-up period.

COMMENTS

Background

Obscure gastrointestinal bleeding (OGIB) is a frequent problem in the daily gastroenterology practice that represents nearly 5% of all gastrointestinal (GI) hemorrhages. The most extensive location of OGIB is small bowel, where it is usually far beyond the range of a standard endoscopic examination. Therefore, capsule endoscopy (CE) is the preferred technique to assess patients with OGIB. The high specificity and sensitivity of CE in OGIB cases and increased diagnostic value of this method was shown in several previously published studies. Even though diagnostic value of CE is the focus point of most studies, in the literature there is not enough data about the long-term results of using CE and its effectiveness in predicting and assessment of rebleeding risks.

Research frontiers

Diagnosis of OGIB is mostly dependent on CE. However, there is not enough data about the long-term outcomes of patients with OGIB who applied CE.

Innovations and breakthroughs

The authors evaluated 139 patients with OGIB diagnosed by CE in a long-term follow-up study. Several risk factors for rebleeding were detected. Negative CE correlated with a significantly lower rebleeding rate.

Applications

CE is a safe, well-tolerated and powerful diagnostic tool which may also provide prognostic implications.

Terminology

OGIB usually originates from small bowel and is not detected by both

esophagogastroduodenoscopy and colonoscopy. CE is a device with a tiny camera. Following the administration of the capsule, the camera within the capsule can obtain pictures of GI tract and gut as it passes through the GI system of the patient. The images obtained are transferred into an external disk using wireless technology and those images are later reviewed by the gastroenterologist.

Peer-review

It is an important novel study on CE for diagnosis of obscure GI bleeding and rebleeding rates on long term basis.

REFERENCES

- Pennazio M**, Spada C, Eliakim R, Keuchel M, May A, Mulder CJ, Rondonotti E, Adler SN, Albert J, Baltes P, Barbaro F, Cellier C, Charton JP, Delvaux M, Despott EJ, Domagk D, Klein A, McAlindon M, Rosa B, Rowse G, Sanders DS, Saurin JC, Sidhu R, Dumonceau JM, Hassan C, Gralnek IM. 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**: 352-376 [PMID: 25826168 DOI: 10.1055/s-0034-1391855]
- Carey EJ**, Leighton JA, Heigh RI, Shiff AD, Sharma VK, Post JK, Fleischer DE. A single-center experience of 260 consecutive patients undergoing capsule endoscopy for obscure gastrointestinal bleeding. *Am J Gastroenterol* 2007; **102**: 89-95 [PMID: 17100969 DOI: 10.1111/j.1572-0241.2006.00941.x]
- Rockey DC**. Occult gastrointestinal bleeding. *N Engl J Med* 1999; **341**: 38-46 [PMID: 10387941 DOI: 10.1056/NEJM199907013410107]
- Scapa E**, Jacob H, Lewkowicz S, Migdal M, Gat D, Gluckhovski A, Gutmann N, Fireman Z. Initial experience of wireless-capsule endoscopy for evaluating occult gastrointestinal bleeding and suspected small bowel pathology. *Am J Gastroenterol* 2002; **97**: 2776-2779 [PMID: 12425547 DOI: 10.1111/j.1572-0241.2002.07021.x]
- Iddan G**, Meron G, Glukhovsky A, Swain P. Wireless capsule endoscopy. *Nature* 2000; **405**: 417 [PMID: 10839527 DOI: 10.1038/35013140]
- Swain P**, Fritscher-Ravens A. Role of video endoscopy in managing small bowel disease. *Gut* 2004; **53**: 1866-1875 [PMID: 15542530 DOI: 10.1136/gut.2003.035576]
- Raju GS**, Gerson L, Das A, Lewis B; American Gastroenterological Association. American Gastroenterological Association (AGA) Institute technical review on obscure gastrointestinal bleeding. *Gastroenterology* 2007; **133**: 1697-1717 [PMID: 17983812 DOI: 10.1053/j.gastro.2007.06.007]
- Magalhães-Costa P**, Bispo M, Santos S, Couto G, Matos L, Chagas C. Re-bleeding events in patients with obscure gastrointestinal bleeding after negative capsule endoscopy. *World J Gastrointest Endosc* 2015; **7**: 403-410 [PMID: 25901220 DOI: 10.4253/wjge.v7.i4.403]
- Tan W**, Ge ZZ, Gao YJ, Li XB, Dai J, Fu SW, Zhang Y, Xue HB, Zhao YJ. Long-term outcome in patients with obscure gastrointestinal bleeding after capsule endoscopy. *J Dig Dis* 2015; **16**: 125-134 [PMID: 25495855 DOI: 10.1111/1751-2980.12222]
- Pennazio M**, Santucci R, Rondonotti E, Abbiati C, Beccari G, Rossini FP, De Franchis R. Outcome of patients with obscure gastrointestinal bleeding after capsule endoscopy: report of 100 consecutive cases. *Gastroenterology* 2004; **126**: 643-653 [PMID: 14988816 DOI: 10.1053/j.gastro.2003.11.057]
- Lai LH**, Wong GL, Chow DK, Lau JY, Sung JJ, Leung WK. Long-term follow-up of patients with obscure gastrointestinal bleeding after negative capsule endoscopy. *Am J Gastroenterol* 2006; **101**: 1224-1228 [PMID: 16771942]
- Macdonald J**, Porter V, McNamara D. Negative capsule endoscopy in patients with obscure GI bleeding predicts low rebleeding rates. *Gastrointest Endosc* 2008; **68**: 1122-1127 [PMID: 19028220 DOI: 10.1016/j.gie.2008.06.054]
- Park JJ**, Cheon JH, Kim HM, Park HS, Moon CM, Lee JH, Hong SP, Kim TI, Kim WH. Negative capsule endoscopy without subsequent enteroscopy does not predict lower long-term rebleeding rates in patients with obscure GI bleeding. *Gastrointest Endosc* 2010; **71**: 990-997 [PMID: 20304392 DOI: 10.1016/j.gie.2009.12.009]
- Delvaux M**, Fassler I, Gay G. Clinical usefulness of the endoscopic video capsule as the initial intestinal investigation in patients with obscure digestive bleeding: validation of a diagnostic strategy based on the patient outcome after 12 months. *Endoscopy* 2004; **36**: 1067-1073 [PMID: 15578296]
- Arakawa D**, Ohmiya N, Nakamura M, Honda W, Shirai O, Itoh A, Hirooka Y, Niwa Y, Maeda O, Ando T, Goto H. Outcome after enteroscopy for patients with obscure GI bleeding: diagnostic comparison between double-balloon endoscopy and videocapsule endoscopy. *Gastrointest Endosc* 2009; **69**: 866-874 [PMID: 19136098 DOI: 10.1016/j.gie.2008.06.008]
- Iwamoto J**, Mizokami Y, Shimokobe K, Yara S, Murakami M, Kido K, Ito M, Hirayama T, Saito Y, Honda A, Ikegami T, Ohara T, Matsuzaki Y. The clinical outcome of capsule endoscopy in patients with obscure gastrointestinal bleeding. *Hepatogastroenterology* 2011; **58**: 301-305 [PMID: 21661386]
- Lorceau-Savale C**, Ben-Soussan E, Ramirez S, Antonietti M, Lerebours E, Ducrotte P. Outcome of patients with obscure gastrointestinal bleeding after negative capsule endoscopy: results of a one-year follow-up study. *Gastroenterol Clin Biol* 2010; **34**: 606-611 [PMID: 20822872 DOI: 10.1016/j.gcb.2010.06.009]
- Koh SJ**, Im JP, Kim JW, Kim BG, Lee KL, Kim SG, Kim JS, Jung HC. Long-term outcome in patients with obscure gastrointestinal bleeding after negative capsule endoscopy. *World J Gastroenterol* 2013; **19**: 1632-1638 [PMID: 23539070 DOI: 10.3748/wjg.v19.i10.1632]
- Rahmi G**, Samaha E, Vahedi K, Delvaux M, Gay G, Lamouliatte H, Filoche B, Saurin JC, Ponchon T, Rhun ML, Coumaros D, Bichard P, Manière T, Lenain E, Chatellier G, Cellier C. Long-term follow-up of patients undergoing capsule and double-balloon enteroscopy for identification and treatment of small-bowel vascular lesions: a prospective, multicenter study. *Endoscopy* 2014; **46**: 591-597 [PMID: 24830401 DOI: 10.1055/s-0034-1365514]
- Min YW**, Kim JS, Jeon SW, Jeon YT, Im JP, Cheung DY, Choi MG, Kim JO, Lee KJ, Ye BD, Shim KN, Moon JS, Kim JH, Hong SP, Chang DK. Long-term outcome of capsule endoscopy in obscure gastrointestinal bleeding: a nationwide analysis. *Endoscopy* 2014; **46**: 59-65 [PMID: 24254387 DOI: 10.1055/s-0033-1358803]
- Shinozaki S**, Yamamoto H, Yano T, Sunada K, Hayashi Y, Shinhata H, Sato H, Despott EJ, Sugano K. Favorable long-term outcomes of repeat endotherapy for small-intestine vascular lesions by double-balloon endoscopy. *Gastrointest Endosc* 2014; **80**: 112-117 [PMID: 24444670 DOI: 10.1016/j.gie.2013.11.029]
- Sakai E**, Endo H, Taniguchi L, Hata Y, Ezuka A, Nagase H, Yamada E, Ohkubo H, Higurashi T, Sekino Y, Koide T, Iida H, Hosono K, Nonaka T, Takahashi H, Inamori M, Maeda S, Nakajima A. Factors predicting the presence of small bowel lesions in patients with obscure gastrointestinal bleeding. *Dig Endosc* 2013; **25**: 412-420 [PMID: 23368528 DOI: 10.1111/den.12002]
- Sidhu R**, Sanders DS, Sakellariou VP, McAlindon ME. Capsule endoscopy and obscure gastrointestinal bleeding: are transfusion dependence and comorbidity further risk factors to predict a diagnosis? *Am J Gastroenterol* 2007; **102**: 1329-1330 [PMID: 17531021 DOI: 10.1111/j.15s72-0241.2007.01171.x]

P- Reviewer: ElGeidie AAR, Yu B S- Editor: Gong XM
L- Editor: A E- Editor: Liu SQ





Published by **Baishideng Publishing Group Inc**

8226 Regency Drive, Pleasanton, CA 94588, USA

Telephone: +1-925-223-8242

Fax: +1-925-223-8243

E-mail: bpgoffice@wjgnet.com

Help Desk: <http://www.wjgnet.com/esps/helpdesk.aspx>

<http://www.wjgnet.com>

