Communication from the ASGE Standards of Practice Committee

GUIDELINE

The role of endoscopy in the management of suspected small-bowel bleeding

Prepared by: ASGE STANDARDS OF PRACTICE COMMITTEE

Suryakanth R. Gurudu, MD, FASGE, David H. Bruining, MD, Ruben D. Acosta, MD, Mohamad A. Eloubeidi, MD, MHS, FASGE, Ashley L. Faulx, MD, FASGE, Mouen A. Khashab, MD, Shivangi Kothari, MD, Jenifer R. Lightdale, MD, MPH, FASGE, NASPGHAN representative, V. Raman Muthusamy, MD, FASGE, Julie Yang, MD, John M. DeWitt, MD, FASGE, Chair

This document was reviewed and approved by the Governing Board of the American Society for Gastrointestinal Endoscopy.

This is one of a series of statements discussing the use of GI endoscopy in common clinical situations. The Standards of Practice Committee of the American Society for Gastrointestinal Endoscopy (ASGE) prepared this text. In preparing this guideline, a search of the medical literature was conducted by using PubMed. Additional references were obtained from a search of Web of Science, SCOPUS, and the bibliographies of the identified articles and from recommendations of expert consultants. Guidelines for appropriate use of endoscopy are based on a critical review of the available data and expert consensus at the time the guidelines were drafted. Further controlled clinical studies may be needed to clarify aspects of this guideline. This guideline may be revised as necessary to account for changes in technology, new data, or other aspects of clinical practice. The recommendations are based on reviewed studies and are graded on the strength of the supporting evidence (Table 1).[1] The strength of individual recommendations is based on both the aggregate evidence quality and an assessment of the anticipated benefits and harms. Weaker recommendations are indicated by phrases such as "we suggest," whereas stronger recommendations are typically stated as "we recommend."

This guideline is intended to be an educational device to provide information that may assist endoscopists in providing care to patients. This guideline is not a rule and should not be construed as establishing a legal standard of care or as encouraging, advocating, requiring, or discouraging any particular treatment. Clinical decisions in any particular case involve a complex analysis of the patient's condition and available courses of action. Therefore, clinical considerations may lead an endoscopist to take a course of action that varies from these guidelines.

Obscure GI bleeding (OGIB) has been defined as overt or occult bleeding of unknown origin that persists or recurs after an initial negative bidirectional endoscopic evaluation including ileocolonoscopy and EGD. Overt OGIB refers to visible bleeding (eg, melena or hematochezia), whereas occult OGIB refers to cases of fecal occult blood positivity and/or unexplained iron deficiency anemia. Recent advances in small-bowel imaging, including video capsule endoscopy (VCE), angiography, and device-assisted enteroscopy (DAE), have made it possible to identify a small-bowel bleeding source and therefore manage the majority of patients who present with OGIB.[2] As a result, a recent clinical guideline recommends a shift from the term *obscure GI bleeding* to *small-bowel bleeding*.[3] The term *OGIB* would be reserved for patients in whom the sources of bleeding cannot be identified anywhere in the GI tract after completion of comprehensive evaluation of the entire GI tract, including the small bowel.

Of all the sources of GI bleeding, only a small percentage (5%) is attributed to small-bowel sources.[4,5] Angiectasias of the small bowel account for 20% to 30% of small-bowel bleeding[6-8] and are more commonly seen in older patients. Small-bowel tumors (eg, GI stromal tumors, carcinoid tumors, lymphomas, and adenocarcinomas) can present with small-bowel bleeding in both younger and older patients.[9,10] Other benign etiologies include erosions and ulcers related to the use of nonsteroidal anti-inflammatory drugs (NSAIDs)[11,12] and Crohn's disease.[13] Rare causes of small-bowel bleeding include Meckel's diverticula–associated ulceration (especially in younger patients),[14] radiation enteropathy,[15] Dieulafoy's lesions,[16,17] small-bowel varices, and aortoenteric fistulas.[18,19]

In patients with OGIB, upper and lower GI tract endoscopies often are repeated before small-bowel evaluation

0016-5107/$36.00
http://dx.doi.org/10.1016/j.gie.2016.06.013

TABLE 1. GRADE system for rating the quality of evidence for guidelines[1]

Quality of evidence	Definition	Symbol
High quality	Further research is very unlikely to change our confidence in the estimate of effect.	⊕⊕⊕⊕
Moderate quality	Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.	⊕⊕⊕◯
Low quality	Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.	⊕⊕◯◯
Very low quality	Any estimate of effect is very uncertain.	⊕◯◯◯

GRADE, Grading of Recommendations Assessment, Development and Evaluation.
Adapted from Guyatt et al.[1]

because substantial initial endoscopic miss rates have been reported.[20,21] Techniques for evaluation of the small bowel include VCE, DAE, multiphase CT enterography (CTE), magnetic resonance enterography (MRE), and, in rare instances, intraoperative enteroscopy. These modalities can recognize small-bowel lesions and may impact therapeutic strategies, often preventing surgical interventions. Despite these advances, the most cost-effective approach to the management of patients with suspected small-bowel bleeding has not been fully determined. This guideline is an update of a prior ASGE document on the management of small-bowel bleeding.[22]

EVALUATION AND MANAGEMENT OF PATIENTS WITH SMALL-BOWEL BLEEDING

The evaluation and management of patients with small-bowel bleeding depends on clinical factors, such as the age of the patient, quality of the prior endoscopic evaluation, and the overt or occult status of the bleeding. Clinical signs, such as the nature of the bleeding (eg, melena vs hematochezia), can help direct the choice of endoscopic tests. In addition, local availability of procedures, patient preferences, physician expertise, risks, and costs are also important determinants of management.

Hemodynamic resuscitation is key to the management of all patients with GI bleeding.[23] Moreover, patients on antithrombotic therapy should be managed according to recently published guidelines.[24,25] A suggested algorithm for the management of suspected overt and occult small-bowel bleeding is shown in Figure 1.

Overt small-bowel bleeding

In patients with overt bleeding and a clinical presentation compatible with upper GI bleeding (eg, hematemesis), early EGD (within 24 hours) should be performed before small-bowel evaluation.[23] If an upper endoscopy has been performed recently and was of sufficient quality, then a repeat upper examination could be performed with push enteroscopy to examine for proximal small-bowel lesions. If this does not reveal a source of bleeding, consideration should be given to repeat colonoscopy with evaluation of the terminal ileum.

For hemodynamically stable patients with overt bleeding, after upper and lower endoscopic examinations with normal results, VCE is recommended as the next diagnostic test. DAE can be considered in patients with positive bleeding sources identified on VCE. Multiphase CTE or MRE should be performed first if the patient has potential reasons for capsule retention.

For patients who present with hemodynamically significant bleeding, urgent angiography is recommended for embolization. A CT angiogram (CTA)[26] or red blood cell (RBC) scan can be considered for localization of the bleeding source and to guide timing of the angiogram in hemodynamically stable patients. In patients with surgically altered anatomy in whom portions of the GI tract are bypassed (eg, Roux-en-Y gastrojejunostomy), DAE is the preferred endoscopic modality to assess the excluded luminal segment inaccessible to conventional and capsule endoscopic approaches.[27,28] If these test results are negative, and bleeding recurs, technetium-99m pertechnetate scintigraphy (Meckel scan) can be considered in younger patients. Provocative testing with anticoagulants is rarely considered in patients with recurrent small-bowel bleeding, given safety concerns and limited benefit.[29-31] Intraoperative enteroscopy during laparotomy or laparoscopy is typically used as a last resort in patients with recurrent small-bowel bleeding, such as those requiring multiple transfusions and/or repeated hospitalizations after unrevealing evaluation with VCE and DAE. Because of the high morbidity associated with intraoperative enteroscopy, it is reserved for rare cases in which DAE cannot be performed without lysis of adhesions.[32]

Occult small-bowel bleeding

In patients with occult bleeding, repeat EGD should be considered when an upper GI lesion is suspected, such as in patients with risk factors for mucosal disease caused by NSAID use or if details of the prior EGD are uncertain. Repeat colonoscopy should be considered when the quality of the bowel preparation on the initial examination was suboptimal or when other questions about the quality of the examination exist. Additionally, when there is clinical suspicion for missed colon lesions, repeat colonoscopy may be performed.[33]

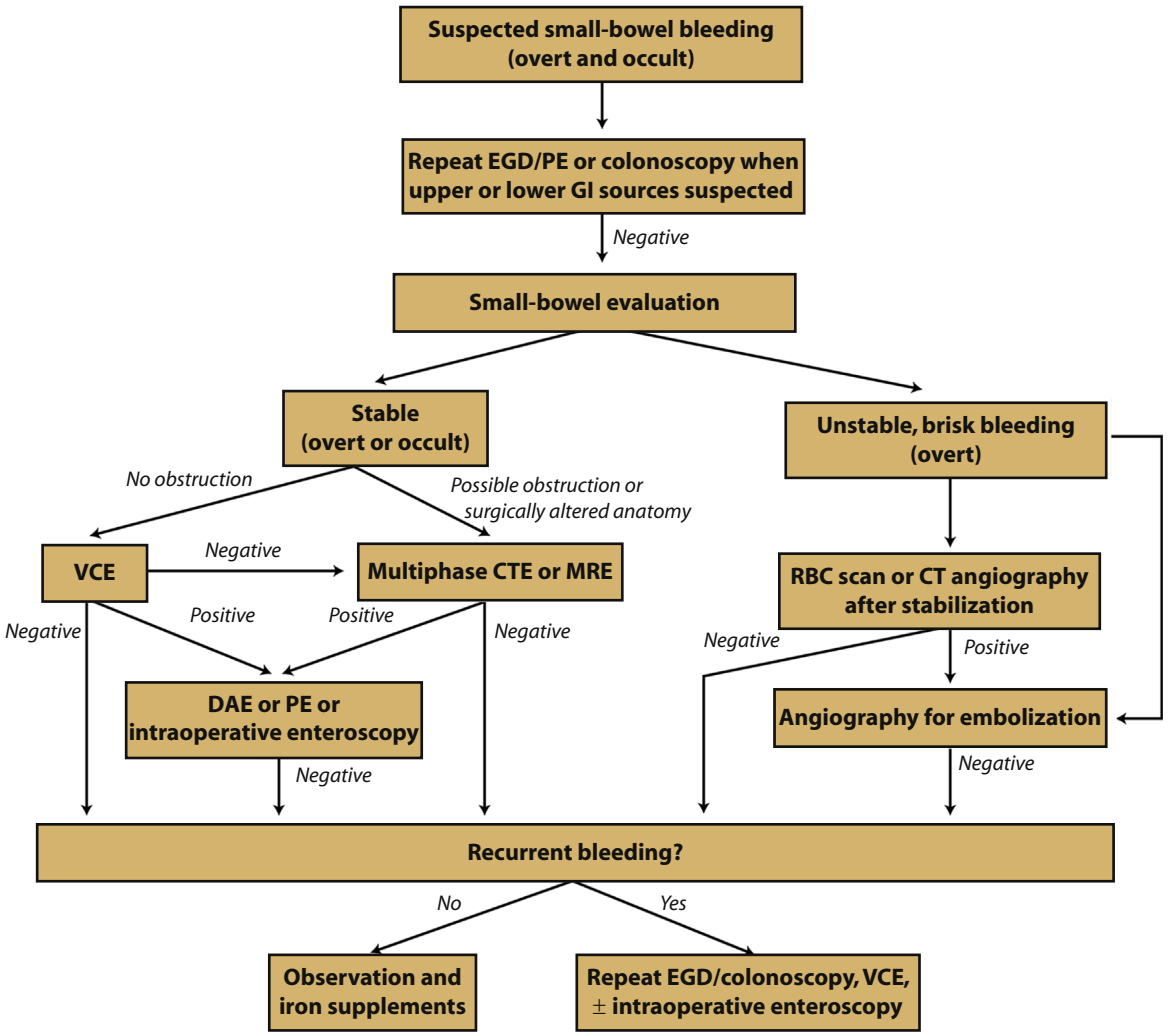

Figure 1. Suggested management approach to overt and occult small-bowel bleeding. Positive test results should direct specific therapy. Because diagnostic tests can be complementary, more than 1 test may be needed, and the first-line test may be based on institutional expertise and availability. *PE,* push enteroscopy; *VCE,* video capsule endoscopy; *DAE,* device-assisted enteroscopy; *CTE,* CT enterography; *MRE,* magnetic resonance enterography; *RBC,* red blood cell.

VCE is considered the first diagnostic step in the evaluation of small-bowel sources of occult bleeding once the upper GI tract and colon have been satisfactorily cleared as potential sources. A follow-up push enteroscopy or DAE is usually recommended for further management of positive results on VCE. Barium radiographic studies, such as small-bowel follow-through and enteroclysis, have low diagnostic yields and no longer have a role in the evaluation of these patients. Multiphase CTE may have a higher sensitivity compared with VCE when patients are being assessed for small-bowel neoplasms and should be performed first if stricture, bowel obstruction, or inflammatory bowel disease is suspected.[34]

If VCE is performed, and a culprit lesion is found, appropriate endoscopic, angiographic, medical, or surgical intervention should be instituted. Several authors have suggested initial VCE followed by therapeutic DAE if the VCE result is positive as the best strategy for increased yield and improved treatment success.[35-37] If the VCE result is negative, the patient's clinical status should dictate the next step. Stable patients may be observed without further evaluation. For patients who need further workup or who have recurrent bleeding, additional diagnostic modalities can be used. Patients who did not have a second-look endoscopy may benefit from repeat EGD and/or ileocolonoscopy. A repeat VCE also may be informative, particularly in patients whose presentations change from occult to overt bleeding or those with decreases in hemoglobin levels of $\geq$4 g/dL.[38]

Role of second-look endoscopy

Repeat EGD may yield a bleeding source even when the initial EGD is negative. For example, in studies of patients with suspected small-bowel bleeding that used small-bowel imaging technologies, suspected sources of bleeding were found within the reach of a standard EGD in 2.8% (4/140)[39]

and 4.7% (6/128) of patients during VCE,[40] in 26% (25/95) of patients in studies that used push enteroscopy,[41] and in 13.1% (14/107) of patients undergoing DAE.[42] Factors associated with an increased yield of repeat EGD include large hiatal hernias, hematemesis, and a history of NSAID use.[43] Patients with upper GI mucosal lesions also may have other contributing causes of iron deficiency anemia, such as malabsorption.[44,45] Small-bowel biopsy to evaluate for underlying celiac disease should be considered in patients with iron-deficiency anemia.[46] In patients with an unrecognized bleeding source, repeat ileocolonoscopy should be considered when clinical suspicion exists for missed colon lesions, although studies have reported variable yields using this strategy. For example, lower GI lesions were found in 0 of 50 patients undergoing repeat colonoscopy before VCE[47] but in 10 of 35 patients (29%) undergoing retrograde balloon–assisted enteroscopy (BAE) 1 week after a colonoscopy with negative results.[42] Miss rates for colon cancers have been attributed to several factors including incomplete procedures, poor bowel preparation, and female sex.[33,48]

Role of push enteroscopy

The diagnostic yield of push enteroscopy for a bleeding source in the setting of suspected small-bowel bleeding is approximately 24% to 56%.[43,49-51] In a study of 63 patients, after exclusion of all lesions proximal to the ligament of Treitz, the diagnostic yield for push enteroscopy was 41% in patients with recurrent overt small-bowel bleeding, 33% in those with persistent overt small-bowel bleeding, and 26% in those with occult small-bowel bleeding.[52] Push enteroscopy allows not only for diagnosis and biopsy but also for therapeutic interventions, such as hemostasis. Decreased transfusion requirements and improvement in functional status 1 year after treatment have been demonstrated after push enteroscopy.[53] In the appropriate clinical settings, push enteroscopy (instead of a repeat EGD) can be the next step when there is a high suspicion for an upper GI source or to treat the lesions that are found on VCE and deemed within the reach of push enteroscopy.

Role of VCE

VCE enables visualization of the entire small intestine in the majority of patients undergoing capsule endoscopy but lacks the potential for therapeutic intervention. A detailed description of VCE can be found in a separate ASGE Technology document.[54] A meta-analysis of 14 prospective studies including 396 patients with small-bowel bleeding showed a higher yield for clinically significant lesions with VCE (56%) than with push enteroscopy (26%) or small-bowel follow-through (6%).[55] A recent prospective multicenter study revealed an overall diagnostic yield of 67% for VCE in the evaluation of overt small-bowel bleeding.[56] In this study, angiectasias were the most common sources (33%) of bleeding identified. Several other prospective studies also revealed very high sensitivity and specificity with VCE for detecting bleeding sources compared with other modalities such as intraoperative enteroscopy, CT angiography, and standard angiography.[57,58] Given its high diagnostic yield, VCE is considered the test of choice in the evaluation of small-bowel bleeding after unrevealing standard endoscopic examinations. The diagnostic yield of VCE is higher if performed within 2 weeks (greatest yield in 48 to 72 hours) of an overt bleeding episode,[59-61] and timing of capsule endoscopy can influence the diagnosis and outcomes in patients with small-bowel bleeding by identifying patients for early intervention. In addition, several other factors such as hemoglobin <10 g/dL, longer duration of bleeding (>6 months), presentation with overt bleeding, male sex, age >60 years, and inpatient status may identify patients with a greater chance of positive results on VCE.[60,62,63]

If significant lesions are detected on VCE, the patient should be referred for specific management of these findings. VCE findings leading to endoscopic or surgical interventions or change in medical management have been reported in 37% to 87% of patients.[64,65] Repeat bleeding rates after a VCE study with negative results are generally low (6%-11%).[66,67] If the VCE study fails to identify the cause of small-bowel bleeding, a second VCE study may be considered, particularly at the time of repeat bleeding, although outcomes have been mixed. In a prospective study of 76 patients with persistent small-bowel bleeding and initial nondiagnostic VCE results, a second-look VCE showed positive results in 49% of patients.[68] One small, prospective study of 20 patients with iron-deficiency anemia[38] found that 35% of second VCE studies showed positive or suspected findings, and 10% resulted in a change in clinical management.

Limitations of VCE include the inability to provide therapy or precisely locate a lesion, false-positive results, or potentially missed lesions. The primary risk of VCE is capsule retention, occurring in 1.4% of VCE examinations in 1 large study.[69]

Role of DAE

DAE encompasses both BAE (ie, single-balloon system, double-balloon systems) and spiral enteroscopy.[70-73] Total enteroscopy may be achieved through a combination of antegrade and retrograde approaches.[70] A detailed discussion of the role of DAE (deep enteroscopy) in the management of small-bowel disorders can be found in a separate ASGE document.[74]

In multiple large studies of patients with small-bowel bleeding who underwent BAE, the diagnostic yield ranged from 43% to 81%,[75-81] and rates of treatment success ranged between 43% and 84%.[76-80] A meta-analysis of 11 studies comparing the yield of VCE and double-balloon enteroscopy (DBE), including 375 patients with small-bowel disease, reported comparable diagnostic yields

(60% vs 57%, respectively; $P = .42$) for all indications. However, a recent meta-analysis suggested a higher yield for DBE when it was performed after a VCE with a positive result as compared with a negative result (75% vs 27.5%; $P = .02$).[82]

Limited data are available in reference to the role of early DBE in the management of overt small-bowel bleeding. A recent study reported a high diagnostic and therapeutic yield (90%) with early (within 24 hours) DBE[83] in 10 patients with overt small-bowel bleeding. Another retrospective study[84] showed a higher diagnostic yield and lower incidence of recurrent bleeding with urgent DBE (within 72 hours after the last visible GI bleeding) compared with non-urgent DBE (diagnostic yield of 70% vs 30%; $P < .05$) in 120 patients with obscure small-bowel bleeding. These studies suggest that early intervention with DBE may yield better outcomes.

Single-balloon enteroscopy and spiral enteroscopy also have been studied in patients with small-bowel bleeding. The diagnostic yield of single-balloon enteroscopy ranged from 58% to 74% in patients with suspected small-bowel disorders.[85,86] A recent systematic review and meta-analysis suggested similar performance of single-balloon enteroscopy and DBE in terms of diagnostic and therapeutic yield.[87] Initial series[88] reported a low diagnostic yield with spiral enteroscopy (33%), but a more recent prospective study reported a higher yield (57%-62%) and improved outcomes in terms of transfusion requirements, iron supplementation, and additional therapeutic procedures with spiral enteroscopy in patients with small-bowel disorders.[89]

A modeled cost-minimization analysis of the management of small-bowel bleeding proposed BAE as the most cost-effective initial test after standard endoscopy if the goal is treatment or definitive diagnosis, as opposed to visualization alone.[90] Another model suggested that initial BAE was a cost-effective approach for patients with small-bowel bleeding who likely have angiectasias in the small bowel accessible with a single antegrade approach.[91]

Role of intraoperative enteroscopy

Intraoperative enteroscopy during laparotomy or laparoscopy is typically considered as a last resort in the management of patients with obscure small-bowel bleeding requiring multiple transfusions and/or repeated hospitalizations.[92] Endoscopic evaluation can be performed orally, rectally, and/or through enterotomies at the time of surgery. Diagnostic yields of intraoperative enteroscopy in small-bowel bleeding are reported to be between 58% and 88%.[93-95] The role of intraoperative enteroscopy in coordination with VCE was evaluated in a study of 18 patients with small-bowel bleeding. In the 15 patients with lesions on VCE, intraoperative enteroscopy yielded treatment in 13 (87%), whereas in the 3 VCE studies with negative results, the intraoperative enteroscopy result was normal, suggesting an important directive role for VCE.[96] Common adverse events associated with intraoperative enteroscopy include serosal tears, avulsion of mesenteric vessels, and prolonged ileus.[97] Because of the high morbidity associated with intraoperative enteroscopy, its use is currently reserved for rare cases in which other modalities have failed to identify a lesion, or deep enteroscopy cannot be performed without lysis of adhesions.[32]

Role of radiographic studies of the small bowel

Until recently, small-bowel follow-through was routinely used to screen the small intestine for a potential bleeding source. The yield of small-bowel follow-through in the evaluation of small-bowel bleeding is extremely low (3%-6%).[55,98] In a small study, push enteroscopy demonstrated a superior diagnostic yield in the detection of small-bowel bleeding sources, compared with small-bowel follow-through.[99] Enteroclysis allows more detailed visualization of the small bowel, with particular utility in the detection of inflammatory bowel disease and neoplasms in patients with small-bowel bleeding.[100] However, enteroclysis has not been shown to be useful in the detection of angiectasia, and it identified a bleeding source in only 8% of patients with negative push enteroscopy results.[101,102] In patients with active bleeding, the use of contrast material may complicate subsequent evaluation with endoscopy or other radiologic imaging tests. Both small-bowel follow-through and enteroclysis should therefore be considered of limited value and no longer part of the routine evaluation of GI bleeding.

In contrast, multiphase CTE has emerged as a new modality for small-bowel investigation in patients with small-bowel bleeding. This technique uses large-volume neutral oral contrast material to distend the small intestine and enhance mural assessment. In addition, intravenous contrast material is administered, and images are typically acquired in the arterial phase (usually 30 seconds after the intravenous bolus), enteric phase (50 seconds after bolus), and delayed phase (90 seconds after bolus).[103] This technique can detect inflammatory lesions, neoplasms, and vascular abnormalities including angiectasias, varices, and Dieulafoy's lesions, aortoenteric fistulas, and pseudoaneurysms. Similar to VCE, multiphase CTE may aid the clinician by determining whether the antegrade or retrograde approach is more appropriate for DAE. In a comparison study of VCE and CTE in 17 patients with small-bowel tumors, CTE detected the lesion in 16 of 17 patients (94.1%), and VCE detected the lesion in only 6 of 17 patients (35.3%).[34] These data suggest that multiphase CTE should be considered when a small-bowel neoplasm is suspected in the differential diagnosis, such as young patients with small-bowel bleeding. In a meta-analysis of 18 studies, Wang et al[104] reported a pooled yield of 40% with CTE compared with 53% with VCE in patients with small-bowel bleeding. In a study of 52 patients

with small-bowel bleeding and nondiagnostic VCE results, subsequent CTE revealed a 50% positive yield.[105] In another study of 30 patients with negative CTE results, subsequent VCE revealed a 57% positive yield.[106] These studies support the complementary role of CTE and VCE in the evaluation of patients with small-bowel bleeding. MRE is another imaging option that can be considered as an alternative to CTE in patients with suspected small-bowel obstruction. However, the data are limited regarding the role of MRE in suspected small-bowel bleeding.[107,108] Multiphase CT or CTA refers to a technique that is similar to CTE but without oral contrast. A meta-analysis of 9 studies with 198 patients revealed a pooled diagnostic sensitivity of 89% and specificity of 85% with CTA in patients presenting with GI bleeding.[26] CTA is widely available and can be performed rapidly for localization of the source of bleeding in patients presenting with acute GI bleeding.

Radioisotope bleeding scans may be helpful in cases of overt small-bowel bleeding if the bleeding rate is at least 0.1 to 0.4 mL/minute.[112] Technetium 99m-labeled RBC scintigraphy (RBC scan), although sensitive, can identify only a general area of bleeding and is very limited in directing subsequent treatment. Patients with positive RBC scan results should be referred immediately to angiography for treatment. Results from studies of technetium-labeled RBC scintigraphy vary widely[109-112] and may reflect differences in patient selection and timing of the study in relation to clinical presentation of bleeding. In 1 study of 103 patients with suspected small-bowel bleeding, scintigraphy failed to localize hemorrhage in 85% of cases.[113] In pediatric patients and young adults, the Meckel scan is a useful test for overt small-bowel bleeding, with a sensitivity ranging between 62% and 87.5% for ectopic gastric mucosa.[114,115]

Angiography also may be helpful in the evaluation of overt small-bowel bleeding if the bleeding rate is >0.5 mL/minute. Although technically less sensitive than nuclear scans, it is more effective at localizing the bleeding site, and immediate therapy can be undertaken if a bleeding source is identified. However, there are limited data on the diagnostic yield of angiography in small-bowel bleeding. Reported yields range from 20% to 77% in GI bleeding.[26,116,117] Angiography carries the potential for therapy. Selective mesenteric embolization can be considered to reduce the risk of intestinal ischemia, which is a concern with embolization.[118,119]

Specific therapy for small-bowel bleeding sources

Therapy for small-bowel bleeding depends on the etiology of the bleeding. Lesions found within the reach of a standard endoscope can be treated with appropriate therapy such as electrocautery, argon plasma coagulation, injection therapy, mechanical hemostasis (eg, hemoclips or bands), or a combination of these techniques. More distal vascular lesions, such as angiectasias, may be approached for therapy via push enteroscopy or DAE, depending on location. There is evidence that treatment has a positive impact on clinical outcome, by decreasing blood loss and the need for blood transfusions.[120,121] Masses or tumors likely require surgical intervention, and management of massive bleeding should be coordinated with surgery and interventional radiology. After appropriate endoscopic and imaging studies, clinically stable patients with iron deficiency may be managed with iron therapy alone and followed clinically. Iron supplementation or blood transfusions may also be required in some patients with comorbidities and those who are not ideal candidates for repeat endoscopy.

Hormonal therapy for angiectasias largely has been abandoned because of lack of efficacy demonstrated in randomized controlled trials.[122-124] Octreotide and low-dose thalidomide have shown some benefit in eliminating the need for blood transfusions and iron supplementation in patients with chronic blood loss from angiectasias[125-129] and they can be considered for patients who are not candidates for endoscopic therapy or who continue to bleed after endoscopic therapy.

Recommendations

1. For patients with signs or symptoms consistent with recurrent upper or lower GI sources of bleeding, we suggest repeating EGD and colonoscopy, respectively, before small-bowel evaluation. ⊕⊕◯◯
2. We suggest VCE as the initial test for patients with overt or occult small-bowel bleeding. Positive VCE results should be followed with push enteroscopy if within reach or DAE. ⊕⊕◯◯
3. We suggest DAE or push enteroscopy if VCE is unavailable or nondiagnostic in patients with overt small-bowel bleeding. ⊕⊕◯◯
4. We suggest that in select circumstances (eg, high level of suspicion of small-bowel angiectasias or in patients with surgically altered anatomy) DAE may be considered as the initial small-bowel diagnostic procedure in patients with small-bowel bleeding. ⊕⊕◯◯
5. We suggest that after an appropriate negative evaluation, clinically stable patients without recurrent bleeding may be treated with iron therapy and clinically followed if iron deficiency is present. ⊕⊕◯◯
6. We suggest multiphase CTE or MRE in patients with obscure bleeding and suspected small-bowel neoplasms. ⊕⊕⊕◯
7. Following appropriate hemodynamic resuscitation, we recommend angiography for selective embolization in patients who present with hemodynamically unstable suspected small-bowel bleeding. ⊕⊕⊕◯
8. We suggest a CTA or RBC scan for localization of the bleeding site and to guide timing of angiography in hemodynamically stable patients with suspected active small-bowel bleeding. ⊕⊕◯◯

DISCLOSURES

R. Muthusamy is a consultant for Boston Scientific and received research support from Covidien GI Solutions. M. Khashab is a consultant for Boston Scientific. All other authors disclosed no financial relationships relevant to this publication.

Abbreviations: ASGE, American Society for Gastrointestinal Endoscopy; BAE, balloon-assisted enteroscopy; CTA, CT angiogram; CTE, CT enterography; DAE, device-assisted enteroscopy; DBE, double-balloon enteroscopy; MRE, magnetic resonance enterography; NSAID, nonsteroidal anti-inflammatory drug; OGIB, obscure GI bleeding; RBC, red blood cell; VCE, video capsule endoscopy.

REFERENCES

1. Guyatt G, Oxman A, Vist G, et al. GRADE: an emerging consensus on rating quality of evidence and strength of recommendations. Br Med J 2008;336:924-6.
2. 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) guideline. Endoscopy 2015;47:352-76.
3. Gerson LB, Fidler JL, Cave DR, et al. ACG clinical guideline: diagnosis and management of small bowel bleeding. Am J Gastroenterol 2015;110:1265-87.
4. Katz LB. The role of surgery in occult gastrointestinal bleeding. Semin Gastrointest Dis 1999;10:78-81.
5. Longstreth GE. Epidemiology and outcome of patients hospitalized with acute lower gastrointestinal hemorrhage: a population-based study. Am J Gastroenterol 1997;92:419-24.
6. Ohmiya N, Yano T, Yamamoto H, et al. Diagnosis and treatment of obscure GI bleeding at double balloon endoscopy. Gastrointest Endosc 2007;66:S72-7.
7. Sun B, Rajan E, Cheng S, et al. Diagnostic yield and therapeutic impact of double-balloon enteroscopy in a large cohort of patients with obscure gastrointestinal bleeding. Am J Gastroenterol 2006;10:2011-5.
8. Pasha S, Leighton J, Das A, et al. Double-balloon enteroscopy and capsule endoscopy have comparable diagnostic yield in small-bowel disease: a meta-analysis. Clin Gastroenterol Hepatol 2008;6:671-6.
9. Cangemi DJ, Patel MK, Gomez V, et al. Small bowel tumors discovered during double-balloon enteroscopy: analysis of a large prospectively collected single-center database. J Clin Gastroenterol 2013;47:769-72.
10. Ross A, Mehdizadeh S, Tokar J, et al. Double balloon enteroscopy detects small bowel mass lesions missed by capsule endoscopy. Dig Dis Sci 2008;53:2140-3.
11. Maiden L. Capsule endoscopic diagnosis of nonsteroidal antiinflammatory drug–induced enteropathy. J Gastroenterol 2009;44:64-71.
12. Hayashi Y, Yamamoto H, Taguchi H, et al. Nonsteroidal anti-inflammatory drug–induced small-bowel lesions identified by double-balloon endoscopy: endoscopic features of the lesions and endoscopic treatment of diaphragm disease. J Gastroenterol 2009;44:57-63.
13. Leighton JA, Triester SL, Sharma VK. Capsule endoscopy: meta-analysis for use with obscure gastrointestinal bleeding and Crohn's disease. Gastrointest Endosc Clin N Am 2006;16:229-50.
14. Kiratli P, Aksoy T, Bozkurt M, et al. Detection of ectopic gastric mucosa using 99mTc pertechnetate: review of the literature. Ann Nucl Med 2009;23:97-105.
15. Nakamura M, Hirooka Y, Watanabe O, et al. Three cases with active bleeding from radiation enteritis that were diagnosed with video capsule endoscopy without retention. Nagoya J Med Sci 2014;76:369-74.
16. Blecker D, Bansal M, Zimmerman RL, et al. Dieulafoy's lesion of the small bowel causing massive gastrointestinal bleeding: two case reports and literature review. Am J Gastroenterol 2001;96:902-5.
17. Dulic-Lakovic E, Dulic M, Hubner D, et al. Bleeding Dieulafoy lesions of the small bowel: a systematic study on the epidemiology and efficiency of enteroscopic treatment. Gastrointest Endosc 2011;74:573-80.
18. Traina M, Tarantino I, Barresi L, et al. Variceal bleeding from ileum identified and treated by single balloon enteroscopy. World J Gastroenterol 2009;15:1904-5.
19. Gerard PS, Gerczuk PZ, Idupuganti R, et al. Massive gastrointestinal bleeding due to an aorto-enteric fistula seen by technetium-99m-labeled red blood cell scintigraphy. Clin Nucl Med 2007;32:551-2.
20. Fry LC, Belluti M, Neumann H, et al. Incidence of bleeding lesions within reach of conventional upper and lower endoscopes in patients undergoing double-balloon enteroscopy for obscure gastrointestinal bleeding. Aliment Pharmacol Ther 2009;29:342-9.
21. Lara LF, Bloomfield RS, Pineau BC, et al. The rate of lesions found within reach of esophagogastroduodenoscopy during push enteroscopy depends on the type of obscure gastrointestinal bleeding. Endoscopy 2005;37:745-50.
22. ASGE Standards of Practice Committee; Fisher L, Krinsky ML, Anderson MA, et al. The role of endoscopy in the management of obscure GI bleeding. Gastrointest Endosc 2010;72:471-9.
23. ASGE Standards of Practice Committee; Hwang JH, Fisher DA, Ben-Menachem T, et al. The role of endoscopy in the management of acute non-variceal upper GI bleeding. Gastrointest Endosc 2012;75:1132-8.
24. ASGE Standards of Practice Committee; Acosta RD, Abraham NS, Chandrasekhara V, et al. The management of antithrombotic agents for patients undergoing GI endoscopy. Gastrointest Endosc 2016;83:3-16.
25. Baron TH, Kamath PS, McBane RD. Management of antithrombotic therapy in patients undergoing invasive procedures. N Eng J Med 2013;368:2113-24.
26. Wu LM, Xu JR, Yin Y, et al. Usefulness of CT angiogram in diagnosing acute gastrointestinal bleeding: a meta-analysis. World J Gastroenterol 2010;16:3957-63.
27. Kim DH, Byeon JS, Lee SK, et al. Usefulness of double balloon endoscopy in patients with surgically distorted intestinal anatomy. J Clin Gastroenterol 2009;43:737-42.
28. Baron T. Double-balloon enteroscopy to facilitate retrograde PEG placement as access for therapeutic ERCP in patients with long-limb gastric bypass. Gastrointest Endosc 2006;64:973-4.
29. Bloomfeld RS, Smith TP, Schneider AM, et al. Provocative angiography in patients with gastrointestinal hemorrhage of obscure origin. Am J Gastroenterol 2000;95:2807-12.
30. Ryan JM, Key SM, Dumbleton SA, et al. Nonlocalized lower gastrointestinal bleeding: provocative bleeding studies with intraarterial tPA, heparin and tolazoline. J Vasc Interv Radiol 2001;12:1273-7.
31. Rieder F, Schneidewind A, Bolder U, et al. Use of anticoagulation during wireless capsule endoscopy for the investigation of recurrent obscure gastrointestinal bleeding. Endoscopy 2006;38:526-8.
32. Leighton JA, Goldstein J, Hirota W, et al. Obscure gastrointestinal bleeding. Gastrointest Endosc 2003;58:650-5.
33. Leaper M, Johnston MJ, Barclay M, et al. Reasons for failure to diagnose colorectal carcinoma at colonoscopy. Endoscopy 2004;36:499-503.
34. Hakim FA, Alexander JA, Huprich JE, et al. CT-enterography may identify small bowel tumors not detected by capsule endoscopy: eight years experience at Mayo Clinic Rochester. Dig Dis Sci 2011;56:2914-9.
35. Fujimori S, Seo T, Gudis K, et al. Diagnosis and treatment of obscure gastrointestinal bleeding using combined capsule endoscopy and double balloon endoscopy: 1-year follow-up study. Endoscopy 2007;39:1053-8.

36. Li X, Dai J, Lu H, et al. A prospective study on evaluating the diagnostic yield of video capsule endoscopy followed by directed double-balloon enteroscopy in patients with obscure gastrointestinal bleeding. Dig Dis Sci 2010;55:1704-10.
37. Marmo R, Rotondano G, Casetti T, et al. Degree of concordance between double-balloon enteroscopy and capsule endoscopy in obscure gastrointestinal bleeding: a multicenter study. Endoscopy 2009;41:587-92.
38. Bar-Meir S, Eliakim R, Nadler M, et al. Second capsule endoscopy for patients with severe iron deficiency anemia. Gastrointest Endosc 2004;60:711-3.
39. Kitiyakara T, Selby W. Non-small-bowel lesions detected by capsule endoscopy in patients with obscure GI bleeding. Gastrointest Endosc 2005;62:234-8.
40. Sidhu R, Sanders DS, McAlindon ME. Does capsule endoscopy recognise gastric antral vascular ectasia more frequently than conventional endoscopy? J Gastrointestin Liver Dis 2006;15:375-7.
41. Zamon A, Katon RM. Push enteroscopy for obscure gastrointestinal bleeding yields a high incidence of proximal lesions within reach of standard endoscope. Gastrointest Endosc 1998;47:372-6.
42. Fry LC, Bellutti M, Neumann H, et al. Incidence of bleeding lesions within reach of conventional upper and lower endoscopes in patients undergoing double-balloon enteroscopy for obscure gastrointestinal bleeding. Aliment Pharmacol Ther 2009;29:342-9.
43. Chak A, Koehler MK, Sundaram SN, et al. Diagnostic and therapeutic impact of push enteroscopy: analysis of factors associated with positive findings. Gastrointest Endosc 1998;47:18-22.
44. Rubio-Tapia A, Hill ID, Kelly CP, et al. ACG clinical guidelines: diagnosis and management of celiac disease. Am J Gastroenterol 2013;108:656-76.
45. Harewood G, Holub J, Lieberman D. Variation in small bowel biopsy performance among diverse endoscopy settings: results from a national endoscopic database. Am J Gastroenterol 2004;99:1790-4.
46. Grisolano S, Oxentenko A, Murray J, et al. The usefulness of routine small bowel biopsies in evaluation of iron deficiency anemia. J Clin Gastroenterol 2004;38:756-60.
47. Gilbert D, O'Malley S, Selby W. Are repeat upper gastrointestinal endoscopy and colonoscopy necessary within six months of capsule endoscopy in patients with obscure gastrointestinal bleeding? J Gastroenterol Hepatol 2008;23:1806-9.
48. Singh H, Nugent Z, Demers AA, et al. Rate and predictors of early/missed colorectal cancers after colonoscopy in Maitoba: a population-based study. Am J Gastroenterol 2010;105:2588-96.
49. May A, Nachbar L, Schneider M, et al. Prospective comparison of push enteroscopy and push-and-pull enteroscopy in patients with suspected small-bowel bleeding. Am J Gastroenterol 2006;101:2016-24.
50. de Leusse A, Vahedi K, Edery J, et al. Capsule endoscopy or push enteroscopy for first-line exploration of obscure gastrointestinal bleeding? Gastroenterology 2007;132:855-62.
51. Sidhu R, McAlindon M, Kapur K, et al. Push enteroscopy in the era of capsule endoscopy. J Clin Gastroenterol 2008;42:54-8.
52. Lara LF, Bloomfeld RS, Pineau BC. The rate of lesions found within reach of esophagogastroduodenoscopy during push enteroscopy depends on the type of obscure gastrointestinal bleeding. Endoscopy 2005;37:745-50.
53. Vakil N, Huilgol V, Khan I. Effect of push enteroscopy on transfusion requirements and quality of life in patients with unexplained gastrointestinal bleeding. Am J Gastroenterol 1997;92:425-8.
54. ASGE Technology Committee; Wang A, Banerjee S, Barth BA, et al. Wireless capsule endoscopy. Gastrointest Endosc 2013;78:805-15.
55. Triester S, Leighton J, Leontiadis G, et al. A meta-analysis of the yield of capsule endoscopy compared to other diagnostic modalities in patients with obscure gastrointestinal bleeding. Am J Gastroenterol 2005;100:2407-18.
56. Katsinelos P, Lazaraki G, Gkagkalis A, et al. The role of capsule endoscopy in the evaluation and treatment of obscure-overt gastrointestinal bleeding during daily clinical practice: a prospective multicenter study. Scand J Gastroenterol 2014;49:862-70.
57. Hartmann D, Schmidt H, Bolz G, et al. A prospective two-center study comparing wireless capsule endoscopy with intraoperative enteroscopy in patients with obscure GI bleeding. Gastrointest Endosc 2005;61:826-32.
58. Saperas E, Dot J, Videla S, et al. Capsule endoscopy versus computed tomographic or standard angiography for the diagnosis of obscure gastrointestinal bleeding. Am J Gastroenterol 2007;102:731-7.
59. Bresci G, Parisi G, Bertoni M, et al. The role of video capsule endoscopy for evaluating obscure gastrointestinal bleeding: usefulness of early use. J Gastroenterol 2005;40:256-9.
60. Yamada A, Watabe H, Kobayashi Y, et al. Timing of capsule endoscopy influences the diagnosis and outcome in obscure-overt gastrointestinal bleeding. Hepato-Gastroenterol 2012;59:676-9.
61. Singh A, Marshall C, Chaudhuri B, et al. Timing of video capsule endoscopy relative to overt obscure GI bleeding: implications from a retrospective study. Gastrointest Endosc 2013;77:761-6.
62. Lepileur L, Dray X, Antonietti, et al. Factors associated with diagnosis of obscure GI bleeding by video capsule endoscopy. Clin Gastroenterol Hepatol 2012;10:1376-80.
63. Carey EJ, Leighton JA, Heigh RI, et al. A single-center experience of 260 consecutive patients undergoing capsule endoscopy for obscure gastrointestinal bleeding. Am J Gastroenterol 2007;102:89-95.
64. Pennazio M, Santucci R, Rondonotti E, et al. Outcomes of patients with obscure gastrointestinal bleeding after capsule endoscopy: report of 100 consecutive cases. Gastroenterology 2004;126:643-53.
65. Rondonotti E, Villa F, Mulder CJ, et al. Small bowel capsule endoscopy in 2007: indications, risks and limitations. World J Gastroenterol 2007;13:6140-9.
66. Macdonald J, Porter V, McNamara D. Negative capsule endoscopy in patients with obscure GI bleeding predicts low rebleeding rates. Gastrointest Endosc 2008;68:1122-7.
67. Lai L, Wong GLH, Chow DKL, et al. Long-term follow-up of patients with obscure gastrointestinal bleeding after negative capsule endoscopy. Am J Gastroenterol 2006;101:1224-8.
68. Viazis N, Papaxoinis K, Vlachogiannakos J, et al. Is there a role for second-look capsule endoscopy in patients with obscure GI bleeding after a nondiagnostic first test? Gastrointest Endosc 2009;69:850-6.
69. Li F, Gurudu S, De Petris G, et al. Retention of the capsule endoscope: a single-center experience of 1000 capsule endoscopy procedures. Gastrointest Endosc 2008;68:174-80.
70. Yamamoto H, Sekine Y, Sato Y, et al. Total enteroscopy with a nonsurgical steerable double-balloon method. Gastrointest Endosc 2001;53:216-20.
71. Tsujikawa T, Saitoh Y, Andoh A, et al. Novel single-balloon enteroscopy for diagnosis and treatment of the small intestine: preliminary experiences. Endoscopy 2008;40:11-5.
72. Akerman P, Agrawal D, Chen W, et al. Spiral enteroscopy: a novel method of enteroscopy by using the Endo-Ease Discovery SB overtube and a pediatric colonoscope. Gastrointest Endosc 2009;69:327-32.
73. Williamson JB, Judah JR, Gaidos JK, et al. Prospective evaluation of the long-term outcomes after deep small-bowel spiral enteroscopy in patients with obscure GI bleeding. Gastrointest Endosc 2012;76:771-8.
74. ASGE Standards of Practice Committee; Khashab MA, Pasha SF, Muthusamy VR, et al. The role of deep enteroscopy in the management of small-bowel disorders. Gastrointest Endosc 2015;82:600-7.
75. F-c Zhi, Yue H, Jiang B, et al. Diagnostic value of double balloon enteroscopy for small-intestinal disease: experience from China. Gastrointest Endosc 2007;66:S19-21.
76. Zhong J, Ma T, Zhang C, et al. A retrospective study of the application on double-balloon enteroscopy in 378 patients with suspected small-bowel diseases. Endoscopy 2007;39:208-15.
77. Cazzato IA, Cammarota G, Nista EC, et al. Diagnostic and therapeutic impact of double-balloon enteroscopy (DBE) in a series of 100 patients with suspected small bowel diseases. Dig Liver Dis 2007;39:483-7.

78. Nakamura M, Niwa Y, Ohmiya N, et al. Preliminary comparison of capsule endoscopy and double-balloon enteroscopy in patients with suspected small-bowel bleeding. Endoscopy 2006;38:59-66.
79. Mehdizadeh S, Ross A, Gerson L, et al. What is the learning curve associated with double-balloon enteroscopy? Technical details and early experience in 6 U.S. tertiary care centers. Gastrointest Endosc 2006;64:740-50.
80. Manabe N, Tanaka S, Fukumoto A, et al. Double-balloon enteroscopy in patients with GI bleeding of obscure origin. Gastrointest Endosc 2006;64:135-40.
81. Arakawa D, Ohmiya N, Nakamura M, et al. Outcome after enteroscopy for patients with obscure GI bleeding: diagnostic comparison between double-balloon endoscopy and video capsule endoscopy. Gastrointest Endosc 2009;69:866-74.
82. Teshima CW, Kuipers EJ, Van Zanten SV, et al. Double balloon enteroscopy and capsule endoscopy for obscure gastrointestinal bleeding: an updated meta-analysis. J Gastroenterol Hepatol 2011;26:796-801.
83. Monkemuller K, Neumann H, Meyer F, et al. A retrospective analysis of emergency double-balloon enteroscopy for small-bowel bleeding. Endoscopy 2009;41:715-7.
84. Aniwan S, Viriyautsahakul V, Rerknimitr R, et al. Urgent double balloon endoscopy provides higher yield than non-urgent double balloon endoscopy in overt obscure gastrointestinal bleeding. Endosc Int Open 2014;02:E90-5.
85. Upchurch BR, Sanaka MR, Lopez AR, et al. The clinical utility of single-balloon enteroscopy: a single-center experience of 172 procedures. Gastrointest Endosc 2010;71:1218-23.
86. Manno M, Riccioni ME, Cannizzaro R, et al. Diagnostic and therapeutic yield of single-balloon enteroscopy in patients with suspected small-bowel disease: results of the Italian multicenter study. Dig Liver Dis 2013;45:211-5.
87. Lipka S, Rabbanifard R, Kumar A, et al. Single vs double balloon enteroscopy for small bowel diagnostics: a systematic review and meta-analysis. J Clin Gastroenterol 2015;49:177-84.
88. Schembre DB, Ross AS. Spiral enteroscopy: a new twist on overtube-assisted endoscopy. Gastrointest Endosc 2009;69:333-6.
89. Buscaglia JM, Richards R, Wilkinson MN, et al. Diagnostic yield of spiral enteroscopy when performed for the evaluation of abnormal capsule endoscopy findings. J Clin Gastroenterol 2011;45:342-6.
90. Somsouk M, Gralnek I, Inadomi J. Management of obscure occult gastrointestinal bleeding: a cost-minimization analysis. Clin Gastroenterol Hepatol 2008;6:661-70.
91. Gerson L, Kamal A. Cost-effectiveness analysis of management strategies for obscure GI bleeding. Gastrointest Endosc 2008;68:920-36.
92. Cave DR, Cooley JS. Intraoperative enteroscopy: indications and techniques. Gastrointest Endosc Clin N Am 1996;6:793-802.
93. Zaman A, Sheppard B, Katon RM. Total peroral intraoperative enteroscopy for obscure GI bleeding using a dedicated push enteroscope: diagnostic yield and patient outcome. Gastrointest Endosc 1999;50:506-10.
94. Douard R, Wind P, Panis Y, et al. Intraoperative enteroscopy for diagnosis and management of unexplained gastrointestinal bleeding. Am J Surg 2000;180:181-4.
95. Jacobs R, Hartmann D, Benz C, et al. Diagnosis of obscure gastrointestinal bleeding by intra-operative enteroscopy in 81 consecutive patients. World J Gastroenterol 2006;12:313-6.
96. Douard R, Wind P, Berger A, et al. Role of intraoperative enteroscopy in the management of obscure gastrointestinal bleeding at the time of video-capsule endoscopy. Am J Surg 2009;198:6-11.
97. Ress AM, Benacci JC, Sarr MG. Efficacy of intraoperative enteroscopy in diagnosis and prevention of recurrent, occult gastrointestinal bleeding. Am J Surg 1992;163:94-8.
98. Hara AK, Leighton JA, Sharma VK, et al. Small bowel: preliminary comparison of capsule endoscopy with barium study and CT. Radiology 2004;230:260-5.
99. Cellier C, Tkoub M, Gaudric M, et al. Comparison of push-type endoscopy and barium transit study of the small intestine in digestive bleeding and unexplained iron-deficiency anemia. Gastroenterol Clin Biol 1998;22:491-4.
100. Korman U, Kantarci F, Selçuk D, et al. Enteroclysis in obscure gastrointestinal system hemorrhage of small bowel origin. Turk J Gastroenterol 2003;14:243-9.
101. Rajesh A, Sandrasegaran K, Jennings SG, et al. Comparison of capsule endoscopy with enteroclysis in the investigation of small bowel disease. Abdom Imaging 2009;34:459-69.
102. Willis JR, Chokshi HR, Zuckerman GR, et al. Enteroscopy-enteroclysis: experience with a combined endoscopic-radiographic technique. Gastrointest Endosc 1997;45:163-7.
103. Huprich JE, Barkow JM, Hansel SL, et al. Multiphase CT enterography evaluation of small-bowel vascular lesions. AJR Am J Roentgenol 2013;201:65-72.
104. Wang Z, Chen JQ, Liu JL, et al. CT enterography in obscure gastrointestinal bleeding: a systematic review and meta-analysis. J Med Imag Radiat Oncol 2013;57:263-73.
105. Agrawal JR, Travis AC, Mortele KJ, et al. Diagnostic yield of dual-phase computed tomography enterography in patients with obscure gastrointestinal bleeding and a non-diagnostic capsule endoscopy. J Gastroenterol Hepatol 2012;27:751-9.
106. Heo HM, Park CH, Lim JS, et al. The role of capsule endoscopy after negative CT enterography in patients with obscure gastrointestinal bleeding. Eur Radiol 2012;22:1159-66.
107. Wiarda BM, Heine DG, Mensink P, et al. Comparison of magnetic resonance enteroclysis and capsule endoscopy with balloon-assisted enteroscopy in patients with obscure gastrointestinal bleeding. Endoscopy 2012;44:668-73.
108. Bocker U, Dinter D, Litterer C, et al. Comparison of magnetic resonance imaging and video capsule enteroscopy in diagnosing small-bowel pathology: localization-dependent diagnostic yield. Scand J Gastroenterol 2010;45:490-500.
109. Brunnler T, Klebl F, Mundorff S, et al. Significance of scintigraphy for the localisation of obscure gastrointestinal bleedings. World J Gastroenterol 2008;14:5015-9.
110. Dolezal J, Vizd'a J, Kopacova M. Single-photon emission computed tomography enhanced Tc-99m-pertechnetate disodium–labeled red cell scintigraphy in localizing small intestine bleeding: a single-centre twelve-year study. Digestion 2011;84:207-11.
111. Aksoy T. Obscure and occult gastrointestinal bleeding: role of radionuclide imaging. Abdom Imag 2012;37:309-10.
112. Dusold R, Burke K, Carpentier W, et al. The accuracy of technetium-99m-labeled red cell scintigraphy in localizing gastrointestinal bleeding. Am J Gastroenterol 1994;89:345-8.
113. Voeller GR, Bunch G, Britt LG. Use of technetium-labeled red blood cell scintigraphy in the detection and management of gastrointestinal hemorrhage. Surgery 1991;110:799-804.
114. Lin S, Suhocki PV, Ludwig KA, et al. Gastrointestinal bleeding in adults patients with Meckel's diverticulum: the role of technetium 99m pertechnetate scan. South Med J 2002;95:1338-41.
115. Rerksuppaphol S, Hustson JM, Oliver MR. Ranitidine-enhanced 99m technetium pertechnetate imaging in children improves the sensitivity of identifying heterotopic gastric mucosa in Meckel's diverticulum. Pediatr Surg Int 2004;20:323-5.
116. Charbonnet P, Toman J, Buhler L, et al. Treatment of gastrointestinal hemorrhage. Abdom Imag 2005;30:719-26.
117. Abbas SM, Bissett IP, Holden A, et al. Clinical variables associated with positive angiographic localization of lower gastrointestinal bleeding. ANZ J Surg 2005;75:953-7.
118. Tan K-K, Wong D, Sim R. Superselective embolization for lower gastrointestinal hemorrhage: an institutional review over 7 years. World J Surg 2008;32:2707-15.
119. Funaki B. Superselective embolization of lower gastrointestinal hemorrhage: a new paradigm. Abdom Imaging 2004;29:434-8.

120. Gerson LB, Batenic MA, Newsom SL, et al. Long-term outcomes after double-balloon enteroscopy for obscure gastrointestinal bleeding. Clin Gastroenterol Hepatol 2009;7:664-9.
121. Hayat M, Axon AT, O'Mahony S. Diagnostic yield and effect on clinical outcomes of push enteroscopy in suspected small-bowel bleeding. Endoscopy 2000;32:369-72.
122. Jackson CS, Gerson LB. Management of gastrointestinal angiodysplastic lesions (GIADs): a systematic review and meta-analysis. Am J Gastroenterol 2014;109:474-83.
123. Junquera F, Feu F, Papo M, et al. A multicenter, randomized, clinical trial of hormonal therapy in the prevention of rebleeding from gastrointestinal angiodysplasia. Gastroenterology 2001;121:1073-9.
124. Hodgson H. Hormonal therapy for gastrointestinal angiodysplasia. Lancet 2002;359:1630-1.
125. Brown C, Subramanian V, Wilcox CM, et al. Somatostatin analogues in the treatment of recurrent bleeding from gastrointestinal vascular malformations: an overview and systematic review of prospective observational studies. Dig Dis Sci 2010;55:2129-34.
126. Scaglione G, Pietrini L, Russo F, et al. Long-acting octreotide as rescue therapy in chronic bleeding from gastrointestinal angiodysplasia. Aliment Pharmacol Ther 2007;26:935-42.
127. Bon C, Aparicio T, Vincent M, et al. Long-acting somatostatin analogues decrease blood transfusion requirements in patients with refractory gastrointestinal bleeding associated with angiodysplasia. Aliment Pharmacol Ther 2012;36:587-93.
128. Ge ZZ, Chen HM, Gao YJ, et al. Efficacy of thalidomide for refractory gastrointestinal bleeding from vascular malformations. Gastroenterology 2011;141:1629-37.
129. Almadi M, Ghali PM, Constantin A, et al. Recurrent obscure gastrointestinal bleeding: dilemmas and success with pharmacological therapies. Case series and review. Can J Gastroenterol 2009;23:625-31.