A Practical Guide to the Evaluation of Small Bowel Bleeding

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Abstract

Gastrointestinal bleeding is a common clinical problem encountered in both the inpatient and outpatient settings. Although the evaluation of upper and lower gastrointestinal bleeding is often straightforward, bleeding from the small bowel may pose a clinical challenge. In this article, we review the indications, modalities, and differential diagnoses of small bowel bleeding. On completion of the article, clinicians should be able to identify common causes of small bowel bleeding, understand the advantages and disadvantages of the modalities used to evaluate small bowel bleeding, and enact a stepwise management approach to the patient with presumed small bowel bleeding.


Gastrointestinal (GI) bleeding is a common clinical problem encountered by clinicians in both the inpatient and outpatient settings. Gastrointestinal bleeding can be categorized as upper GI bleeding, lower GI bleeding, and small bowel bleeding. Upper GI bleeding refers to bleeding that occurs proximal to the ligament of Treitz and classically presents with melena, hematemesis, or, in the case of brisk
bleeding, hematochezia. Lower GI bleeding refers to a colonic source of bleeding and typically presents with hematochezia. The evaluation of upper and lower GI bleeding requires esophagogastroduodenoscopy (EGD) and colonoscopy, respectively. Small bowel bleeding, however, is less commonly encountered and accounts for only 5% to 10% of GI bleeding cases. In this article, we review the differential diagnosis, diagnostic and therapeutic modalities, and clinical approach to suspected small bowel bleeding.

**CLASSIFICATION OF GASTROINTESTINAL BLEEDING**

The terminology regarding GI bleeding has changed over the years and can be a source of confusion for clinicians. There are 3 main terms to be familiar with: overt GI bleeding, occult GI bleeding, and obscure GI bleeding. Overt GI bleeding refers to GI bleeding that is visible either through bright red blood or through by-products of blood breakdown in the emesis or feces. In contrast to overt GI bleeding, occult GI bleeding refers to a positive fecal occult blood test result and/or iron deficiency anemia without visual evidence of blood or blood breakdown products. In cases of occult GI bleeding (no visible blood), it is recommended to first pursue EGD and colonoscopy to determine a potential source of bleeding. If no source is identified on EGD and colonoscopy and evidence of GI bleeding persists through continued iron deficiency, fecal occult blood test positivity, and/or visible blood loss, it is referred to as obscure GI bleeding. Although all 3 terms are still used, the term obscure GI bleeding has largely been replaced by the term small bowel bleeding because advances in endoscopy, video capsule endoscopy (VCE), and radiographic imaging have allowed for improved identification of small bowel bleeding that was previously difficult to detect. At present, terms that clinicians should be familiar with include overt (visible) GI bleeding, occult (not visible) GI bleeding, and small bowel bleeding (evidence of ongoing GI bleeding without source identification after EGD and colonoscopy).

**DIFFERENTIAL DIAGNOSIS**

Small bowel bleeding encompasses a broad differential diagnosis. When confronted with a patient with presumed small bowel bleeding, it is helpful to consider the possible etiologies on the basis of patient age and comorbidities. Diagnoses to consider in those younger than 40 years include inflammatory bowel disease, polyposis syndromes, and Meckel diverticulum. In those older than 40 years, vascular lesions such as angioectasias and nonsteroidal anti-inflammatory drug–induced ulcers and enteropathy are more common. Etiologies that may be present in both age groups include Dieulafoy lesions (small submucosal arterial bleeds) and neoplastic lesions. Common etiologies of small bowel bleeding are illustrated in Figure 1.

**EVALUATION OF SMALL BOWEL BLEEDING**

The evaluation of presumed small bowel bleeding, as with any GI bleeding, begins with the assessment of the hemodynamic stability of the patient. Small bowel bleeding most often presents as stable overt or occult bleeding, with an unstable presentation being relatively rare. However, if brisk small bowel bleeding is suspected, the patient should be admitted to the hospital with consideration of admission to the intensive care unit if hemodynamic instability is present. Anticoagulation, antiplatelet agents, and nonsteroidal anti-inflammatory drugs should be held if clinically permitted. In general, the goal hemoglobin transfusion threshold should be 7 g/dL for most patients and 8 g/dL for those with coronary artery disease (to convert to mmol/L, multiply by 0.6206).

**Occult or Stable Overt Small Bowel Bleeding**

In patients presenting with occult or stable overt bleeding with negative EGD and colonoscopy results, it is important to first consider repeating EGD or colonoscopy in...
select cases. Evidence for this recommendation comes from VCE studies, which have found a clinically significant nonsmall bowel bleeding source in up to 30% of patients.\(^5\) Consideration of repeat endoscopy is especially important in cases of inadequate or suboptimal colonoscopy preparation, short procedure or withdrawal times, poor patient tolerance of the procedure, or inability to visualize the terminal ileum. In contrast, one important subset of patients to consider for early evaluation of the small bowel are patients with left ventricular assist devices, as small bowel bleeding accounts for up to 30% of GI bleeding episodes in this patient population.\(^6\)

**Video capsule endoscopy.** Video capsule endoscopy (VCE) consists of a capsule device that is either swallowed by the patient or placed endoscopically. After capsule ingestion, the patient wears a sensor array attached to the abdomen with adhesive pads. After 8 to 12 hours of data acquisition, sensors are removed and images are reviewed by a trained gastroenterologist, who uses small bowel passage time to estimate the location of the bleeding source. In cases of occult or stable overt small bowel bleeding, VCE has emerged as the next recommended test after high-quality EGD and colonoscopy.\(^7\) In patients with suspected small bowel bleeding, the detection rates of VCE range from 33% to 73%.\(^7,8\) There are no strict contraindications to VCE, but the main risk is related to capsule retention. Patients considered at highest risk for capsule retention include those with established Crohn disease who have capsule retention rates from 3% to 13%.\(^9,10\) Other risk factors for capsule retention include a history of small bowel obstruction, multiple previous abdominal operations with resultant adhesive disease, and radiation enteritis. In patients without significant risk factors, capsule retention rates are approximately 1% to 2%.\(^8\) Most complications of capsule retention are limited to case reports, and rarely, bowel obstruction or perforation can occur.\(^11\) It is important to note that magnetic resonance imaging is contraindicated in those with a retained capsule device owing to concerns that the strong magnetic field could pull the device through the patient’s body.\(^12\) As part of the consent process for VCE, patients should be counseled about the risks of capsule retention and the rare need for endoscopic or surgical retrieval of the capsule device.

One option to assess the risk of capsule retention is to perform a patency capsule evaluation before VCE. The patency capsule has the same dimensions as the video capsule device and is swallowed by the patient.

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**FIGURE 1.** Common causes of small bowel bleeding. A. angioectasia, B. polyp/neoplasia, C. nonsteroid antiinflammatory (NSAID) ulcers, D. inflammatory bowel disease.
capsule and consists of a small radiofrequency identification tag surrounded by barium absorbable material allowing detection either by the radiofrequency identification tag or radiographically. The patency capsule remains intact for about 80 hours before it dissolves. In a study of patients with known strictures, 56% excreted the patency capsule intact, indicating that they did not have clinically significant obstruction. All patients who excreted the patency capsule intact went on to undergo successful VCE without retention, highlighting the usefulness of the patency capsule in patient selection.

**Multiphasic Computed Tomography Enterography.** Multiphasic, or triple phase, computed tomography (CT) enterography uses both oral and intravenous contrast to capture cross-sectional images in arterial, enteric, and delayed contrast phases. This technology allows the detailed visualization of the small bowel wall and is especially useful for the detection of masses and other structural lesions. Studies have found a 90% to 100% detection rate for small bowel masses, which can be missed on VCE. Although less invasive than VCE, CT enterography may have lower detection rates when used to evaluate GI bleeding, with detection rates between 28% and 35%. Given that intravenous contrast is required, it may not be an appropriate test in those with acute or chronic kidney disease.

**Push Enteroscopy and Balloon-Assisted Enteroscopy.** Push enteroscopy and balloon-assisted endoscopy allow the direct visualization of the small bowel and have both a diagnostic and a potentially therapeutic role in the evaluation of small bowel bleeding. Push enteroscopy uses a longer gastroscope (such as a pediatric colonoscope) that allows deeper intubation of the small bowel past the ligament of Treitz. Push enteroscopy is often used after the identification of a proximal small bowel bleeding source on VCE or as a second-look procedure after a negative EGD result. In cases in which a lesion was found after an initial EGD result had been negative, 53% were in a location only accessible by push enteroscopy, highlighting the use of push enteroscopy as a “second-look” procedure rather than repeating an EGD.

Balloon-assisted enteroscopy is technically more complex than push endoscopy but allows deeper intubation of the small bowel. This can be performed in the anterograde or retrograde manner to visualize the proximal two-thirds or distal one-third of the small bowel, respectively. In general, VCE or multiphasic CT enterography is performed before balloon-assisted enteroscopy to localize the site of bleeding and determine approach (anterograde vs retrograde), as this can increase the diagnostic yield of balloon-assisted enteroscopy. Although bleeding identification varies by study, by using double balloon enteroscopy the detection rates are estimated to range from 53% to 80%. The main advantage of double balloon enteroscopy is the ability to perform therapeutic interventions and mark lesions with ink tattoo for future evaluation. However, rebleeding of vascular lesions such as angioectasias after endoscopic intervention is relatively common and a meta-analysis of 14 trials estimates rates of rebleeding after endoscopic therapy to be 34%. Regardless, endoscopic treatment of vascular lesions has been found to increase hemoglobin levels and decrease the rate of transfusions, highlighting the utility of this intervention. Repeat double balloon enteroscopy procedures are not associated with increased rates of complications, making the procedure safe to repeat if clinically indicated. It is important to note that double balloon enteroscopy carries a higher rate of adverse events (0.8%—1% of cases) than does standard endoscopy, including acute pancreatitis, perforation, and sedation-related adverse events as the procedure takes longer to complete than standard endoscopy. Double balloon enteroscopy is often performed in patients with a left ventricular assist device who experience small bowel
GI bleeding from angioectasias. However, a recent study with 42 patients reported no significant difference in the number of red blood cell transfusions per month or all-cause mortality with endoscopic treatment of identified bleeding lesions by balloon enteroscopy compared with conservative therapy with iron replacement and blood transfusion. Additional research is needed to determine the best practice in this patient population.

Brisk Small Bowel Bleeding
After stabilization of the patient, the evaluation of brisk small bowel bleeding begins with consideration of CT angiography (CTA), conventional angiogram, inpatient capsule endoscopy, or tagged red blood cell scan.

Computed Tomography Angiography and Conventional Angiography. Computed tomography angiography is a widely available modality that involves the administration of timed intravenous contrast to visualize extravasation of contrast material into the GI lumen. In brisk GI bleeding, CTA has excellent sensitivity, with a meta-analysis revealing an approximate sensitivity of 89%. Computed tomography angiography is a diagnostic only modality, and if the result is positive, the recommended next step is conventional angiography with embolization. If the CTA result is negative, bleeding is likely not brisk enough (<0.2 mL/min) to be found and intervened on by conventional angiography, and management of bleeding via the below stable overt pathway is appropriate.

Inpatient Video Capsule Endoscopy. Although the use of early inpatient VCE is evolving and center dependent, studies to date find promise for this diagnostic modality. Early use of capsule endoscopy after hospital admission may lead to superior localization of a bleeding source, with 1 study reporting 64% bleed localization in the early VCE arm vs 31% in the standard of care arm. If brisk small bowel bleeding is discovered, treatment with conventional angiogram or double balloon enteroscopy is an option for therapeutic intervention.

Technetium-99m—Labeled Red Blood Cell Scan. Another option to localize brisk GI bleeding is the technetium-99m—labeled red blood cell scan. The test can detect bleeding rates as low as 0.2 mL/min, leading to mildly increased sensitivity compared with CTA. However, localization of the bleed can be difficult and CTA is likely superior in this regard. Consequently, CTA is often considered first line in cases of presumed brisk small bowel bleeding. One special consideration is the use of a technetium-99m scan to evaluate for Meckel diverticulum, as ectopic gastric mucosa in this condition secretes the radiotracer and allows the noninvasive identification of the condition. Additionally, CTA exposes the patient to intravenous contrast and a technetium-99m scan may be a better option in a patient population with acute or chronic kidney disease. If a technetium-99m—labeled red blood cell scan is obtained and brisk bleeding is localized, treatment with conventional angiogram or double balloon endoscopy is an option for therapeutic intervention.

MANAGEMENT OF PRESUMED SMALL BOWEL BLEEDING
The management of small bowel bleeding begins by determining the patient’s hemodynamic status and appropriate level of care. Patients with brisk small bowel bleeding often require intensive care and consideration should be given to examinations that provide results within a short time frame, such as CTA. In contrast, occult or stable overt small bowel bleeding in patients who are hemodynamically stable can usually be managed in the outpatient setting by using the proposed management algorithm shown in Figure 2 as a guide. In this patient population, if initial EGD and colonoscopy are unremarkable but suboptimal, repeat EGD vs extended upper endoscopy and/or colonoscopy should be considered. If bleeding is not identified on repeat adequate
endoscopic evaluation or the initial endoscopic study is deemed to be acceptable, the next best choice is to perform VCE or multiphasic CT enterography. In making the choice between these two diagnostic modalities, clinicians should take into account contraindications and availability of resources to avoid delay in diagnosis and management. Risk factors for capsule retention should be kept in mind and a patency capsule should be performed in patients at high risk of retention. Multiphasic CT enterography should be avoided in patients with underlying kidney disease given exposure to intravenous contrast but should be considered if there is concern for a structural small bowel lesion.
Once a small bowel bleeding source is identified, the location within the small bowel should be estimated (proximal vs distal) and a decision made whether to pursue push or balloon-assisted enteroscopy in either an anterograde or a retrograde fashion. If a small bowel bleeding source is not identified on initial evaluation, consideration should be given to performing the alternate unperformed diagnostic modality (VCE vs CT enterography) if there is concern for continued bleeding. It is important to keep in mind that the yield of these tests will be significantly higher in patients experiencing overt GI bleeding. If the initial small bowel evaluation is unremarkable and the patient remains hemodynamically stable and not experiencing overt GI bleeding, close follow-up with laboratory monitoring could be considered. Rarely GI bleeding is secondary to a Meckel diverticulum, and consideration should be given to performing a Meckel scan in young adults (age, <30 years) with ongoing evidence of overt GI bleeding.

CONCLUSION
Small bowel bleeding accounts for only 5% to 10% of cases of GI bleeding and most often presents as occult bleeding or overt bleeding in a clinically stable patient. In patients presenting with melena or hematochezia, EGD and/or colonoscopy is generally performed first. If no identifiable etiology is found on EGD or colonoscopy and clinical evidence of GI bleeding persists, it is reasonable to perform further evaluation for small bowel bleeding with VCE or multiphasic CT enterography. Using the approach described in this review, a small bowel bleeding source is usually identified and can be treated appropriately.

Abbreviations and Acronyms: CT, computed tomography; CTA, computed tomography angiogram; EGD, esophagastroduodenoscopy; GI, gastrointestinal; VCE, video capsule endoscopy

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