



# Colonic diverticular bleeding

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## INTRODUCTION

Colonic diverticular bleeding is the most common cause of overt, acute lower gastrointestinal bleeding in adults. Patients with diverticular bleeding usually experience large volume hematochezia and require hospitalization for management. Colonoscopy is the test of choice for most patients, although patients with massive bleeding may require computed tomography (CT) angiography followed by angiography [1]. Surgical intervention for diverticular bleeding is reserved for patients who have failed all other modalities.

This topic will review colonic diverticular bleeding. The general approach to lower gastrointestinal bleeding, the causes of lower gastrointestinal bleeding, and the evaluation of suspected small bowel bleeding are discussed elsewhere. (See "[Approach to acute lower gastrointestinal bleeding in adults](#)" and "[Etiology of lower gastrointestinal bleeding in adults](#)" and "[Evaluation of suspected small bowel bleeding \(formerly obscure gastrointestinal bleeding\)](#)".)

## EPIDEMIOLOGY

Colonic diverticular bleeding is the most common cause of hematochezia (maroon or bright red blood) in hospitalized patients, although the proportion of cases attributed to diverticular bleeding varies across series. For example, 13 percent of cases were attributed to diverticular bleeding in a multicenter study in the United Kingdom versus 63 percent in a multicenter study

in Japan. These differences may reflect differences in biology (right-sided diverticulosis, which is more likely to bleed, is more common in Japan) or approach (26 percent underwent endoscopy in the United Kingdom study, mostly flexible sigmoidoscopy, versus 88 percent in the Japanese study) [2,3].

Among patients with asymptomatic diverticulosis, the risk of bleeding is approximately 0.5 per 1000 person-years [4]. In a study of 1514 asymptomatic patients with diverticulosis, the cumulative incidence of bleeding was 0.2 percent at 12 months, 2.2 percent at 60 months, and 9.5 percent at 120 months [4]. Risk factors for bleeding included age  $\geq 70$  years (adjusted hazard ratio [aHR] 3.7) and bilateral diverticulosis (aHR 2.4). Obesity, [aspirin](#), and non-aspirin nonsteroidal anti-inflammatory drugs increase the risk of incident diverticular bleeding [5,6].

Unlike diverticulitis, which occurs primarily in the left colon, the right colon is the source of colonic diverticular bleeding in 50 to 90 percent of patients [7-10]. This reflects a marked increase in propensity for right-sided diverticula to bleed since in Western countries only 25 percent of diverticula are right-sided [11].

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## PATHOGENESIS

As a diverticulum herniates, the penetrating vessel responsible for the wall weakness at the point of herniation becomes draped over the dome of the diverticulum, separated from the bowel lumen only by mucosa ( [figure 1](#) and [picture 1](#)). It is hypothesized that over time, the vasa recta is exposed to recurrent injury along its luminal aspect, leading to eccentric intimal thickening and thinning of the media. These changes may result in segmental weakness of the artery, predisposing to rupture into the lumen. A possible explanation for the increase in propensity for right-sided diverticula to bleed is that right-sided diverticula have wider necks and domes, exposing a greater length of vasa recta to injury. Another contributing factor may be the thinner wall of the right colon [12]. It is rare for bleeding to coexist with diverticulitis or for both complications to occur in the same patient, and therefore, bleeding and diverticulitis may have different biological underpinnings [8]. (See "[Colonic diverticulosis and diverticular disease: Epidemiology, risk factors, and pathogenesis](#)".)

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## CLINICAL MANIFESTATIONS

**Symptoms** — Patients with colonic diverticular bleeding typically present with painless, large-volume hematochezia that is self-limited. However, in some patients, massive, persistent hematochezia is seen

[13]. Blood originating from the left colon tends to be bright red in color, whereas bleeding from the right side of the colon usually appears dark or maroon-colored and may be mixed with stool. Melena (black, tarry stool) is rare in patients with diverticular bleeding and uncommon in patients with lower gastrointestinal bleeding in general. Rarely, slow bleeding originating from the right side of the colon can produce melena.

Patients typically have few abdominal symptoms, which is a reflection of the noninflammatory pathogenesis of the bleeding. This fact can be used to help distinguish possible diverticular bleeding from ischemic, inflammatory, or infectious colitis, which frequently present with abdominal pain [14]. However, blood within the colon acts as a cathartic, and some patients report bloating, cramping, or the urge to defecate. Symptoms and signs of diverticulitis are not present since the two disorders rarely coexist [8,15]. (See '[Differential diagnosis](#)' below.)

Patients with bleeding that is severe enough to cause hemodynamic instability may report syncope, light-headedness, or postural dizziness.

**Physical examination** — On examination, patients may be normotensive if blood loss has been modest. However, if the bleeding is significant, patients may be tachycardic, hypotensive, and/or orthostatic [13]. The abdominal examination is typically normal. If the bleeding was recent, red or maroon blood can be found on rectal examination. Blood clots in the stool are highly suggestive of a colonic source [16]. Melena (black, tarry stool) is rarely seen in diverticular bleeding.

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## DIAGNOSIS

The diagnosis of colonic diverticular bleeding is suspected in patients with painless, large-volume hematochezia and is made with colonoscopy or imaging (CT angiography). The diagnostic strategy depends on the severity of bleeding. Tagged red blood cell scans are rarely indicated because they are time consuming, not available in many hospitals, and do not provide accurate bleeding localization [1].

**Colonoscopy in hemodynamically stable patients** — For most patients, colonoscopy is the diagnostic test of choice because of its diagnostic and therapeutic capabilities. Diverticular bleeding is an arterial bleed occurring from the neck or dome of a diverticulum. A definitive diagnosis requires active bleeding, a visible vessel, or an adherent clot to be identified at the base or neck of a diverticulum. More commonly, diverticula are seen without another potential source and the diagnosis is considered presumptive. When active bleeding (spurting or oozing) or stigmata of recent hemorrhage (nonbleeding visible vessel or adherent clot which cannot be

removed with lavage) are seen, endoscopic treatments are effective in achieving initial hemostasis and can reduce the risk of recurrent bleeding. A good colon preparation, use of a water jet, and endoscopic cap can improve the detection of stigmata of recent hemorrhage [17]. Multiple randomized trials have demonstrated that early colonoscopy (within 24 hours of initial visit to the hospital) does not improve outcomes [18]. In one such randomized trial in which 170 patients underwent early colonoscopy or elective colonoscopy (24 to 96 hours after hospital admission), early colonoscopy did not improve detection of stigmata of recent hemorrhage as compared with elective colonoscopy [18-20]. There were also no significant differences in rebleeding within 30 days, endoscopic treatment success, need for transfusion, length of stay, thrombotic events within 30 days or death within 30 days between the two groups. (See ['Endoscopic therapy in hemodynamically stable patients'](#) below.)

**CT angiography in unstable patients with severe bleeding** — In patients with severe, ongoing bleeding resulting in hemodynamic instability despite resuscitation, CT angiography can provide a rapid diagnosis of the source without the need for bowel preparation. CT angiography relies on active bleeding, and therefore, is not appropriate for patients without ongoing active blood loss. Patients who have a bleeding source identified on CT angiography should undergo angiography with the goal of treating the bleeding source (see ['Angiography for unstable patients and endoscopic therapy failure'](#) below). The approach to the diagnostic evaluation of a patient with suspected lower gastrointestinal bleeding is discussed in detail elsewhere. (See ["Approach to acute lower gastrointestinal bleeding in adults"](#), section on ['Diagnostic studies'](#).)

**Differential diagnosis** — The differential diagnosis of diverticular bleeding reflects sources that can result in large-volume hematochezia and includes massive upper or middle gastrointestinal bleeding, angiodysplasia, hemorrhoidal bleeding (particularly in patients on antithrombotics), post-procedural bleeding (eg, polypectomy), Dieulafoy's lesion and rectal (stercoral) ulcers [3]. Less commonly, colon cancer, inflammatory bowel disease, ischemic, radiation or infectious colitis result in severe hematochezia ( [table 1](#)) [3]. Other causes of lower gastrointestinal bleeding typically can be differentiated from colonic diverticular bleeding based on colonoscopic findings. (See ["Etiology of lower gastrointestinal bleeding in adults"](#), section on ['Etiology'](#).)

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## MANAGEMENT

The management of colonic diverticular bleeding includes resuscitation and, in most cases, an attempt to identify and treat the bleeding site. Most patients with diverticular bleeding have significant blood loss and require hospital admission.

**Triage, supportive care, resuscitation with IV fluids/blood products** — The initial management of patients with diverticular bleeding is similar to patients with other causes of lower gastrointestinal bleeding and includes triage to the appropriate setting for management (outpatient, inpatient, intensive care unit), general supportive measures (eg, oxygen, establishment of adequate intravenous access), appropriate fluid and blood product resuscitation, and management of coagulopathies, anticoagulants, and antiplatelet agents. The initial management of patients with acute lower gastrointestinal bleeding is discussed in detail separately. (See ["Approach to acute lower gastrointestinal bleeding in adults"](#), section on 'Fluid resuscitation'.)

**Endoscopic therapy in hemodynamically stable patients** — Most patients with suspected lower gastrointestinal bleeding should undergo colonoscopy to determine the underlying etiology and treat the source of bleeding (see ["Approach to acute lower gastrointestinal bleeding in adults"](#), section on 'Colonoscopy'). If active bleeding or a visible vessel (similar to stigmata of ulcer hemorrhage) can be localized to a particular diverticulum during colonoscopy, endoscopic therapy should be attempted [21-24]. Several cohort studies have found that treatment of diverticular stigmata is associated with a decreased risk of rebleeding compared with conservative treatment [23,25]. In one cohort study, endoscopic therapy in patients with definitive diverticular bleeding was associated with lower rates of early rebleeding (27 versus 19 percent), need for subsequent endoscopic therapy (46 versus 18 percent), and length of hospitalization for longer than one week (54 versus 41 percent) as compared with conservative therapy [25].

Endoscopic hemostatic modalities for diverticular bleeding include endoscopic through-the-scope clips, endoscopic band ligation, and contact thermal therapies (bipolar probes, heater probes, monopolar hemostatic forceps). Thermal therapies can be utilized for stigmata at the neck of diverticula but increase the risk of perforation when applied at the base because this location lacks muscularis propria [26]. Endoscopic clips should be applied directly on the bleeding lesion or on both sides [26]. An endoscopic cap can be used to suction and evert the diverticulum for better localization of the stigmata [27]. Closing bleeding diverticula using a zipper technique has been reported but may be associated with higher rebleeding rates when the bleeding source was not captured by indirect clip placement as the bleeding vessel may not be directly treated [28]. Treatment with band ligation entails marking the culprit diverticulum, withdrawing the endoscope to apply the banding device, suctioning the diverticulum into the cap and deploying the band. This technique has been highly effective and safe in several series from Japan where most bleeding diverticula are located in the right colon [29]. Injection of dilute [epinephrine](#) can be used as an adjunct to temporarily control active bleeding but should not be used as monotherapy. Doppler ultrasound probe may aid effective endoscopic treatment, but

its use has largely been limited to expert centers [26]. Other less well-studied techniques include over-the-scope clips, detachable snares, and topical hemostatic powders.

A systematic review and meta-analysis of endoscopic therapy in 384 patients with diverticular bleeding found thermal methods, clipping, and band ligation achieved initial hemostasis in 99 to 100 percent of patients [30]. A meta-analysis of 16 studies and 780 patients concluded that endoscopic band ligation reduced the risk of early (8 versus 19 percent) and late (9 versus 29 percent) rebleeding when compared with through-the-scope clipping [31]. A large, retrospective, multicenter study in Japan also found endoscopic band ligation to be superior to clipping [29]. However, most of the patients in these studies were from Japan where the epidemiology, presentation, and pathophysiology of diverticular bleeding appears to be different from Western populations.

**Angiography for unstable patients and endoscopic therapy failure** — Angiography requires active bleeding (extravasation) for source localization and treatment. Therefore, most patients undergoing angiography have severe hematochezia with hemodynamic instability and have had a source identified on CT angiography or identified but inadequately treated on colonoscopy. Angiographic treatment is more likely if angiography immediately follows a positive CT angiography (ideally within 90 minutes) [32,33]. This may be particularly true in diverticular bleeding, which tends to be intermittent.

Once the bleeding site is identified, transcatheter embolization can be performed using microcatheters for super-selective embolization of the bleeding site (eg, a single vasa recta feeding a diverticulum) ( [picture 2](#)). This technique minimizes ischemic complications. Embolization can be performed with a variety of materials including microcoils, N-Butyl cyanoacrylate, or an ethylene-vinyl copolymer. Technical success rates are high, with embolization performed in 75 to 100 percent [34]. In a meta-analysis of 25 studies, rebleeding occurred in 15 percent of patients with diverticular bleeding treated via transcatheter embolization [35]. Bowel ischemia is the most common and serious complication, although ischemia requiring treatment is rare (approximately 3 percent) [34]. The techniques used for angiographic control of gastrointestinal bleeding are discussed in detail elsewhere [34]. (See "[Angiographic control of nonvariceal gastrointestinal bleeding in adults](#)", section on '[Angiographic therapies](#)'.)

**Surgical intervention for refractory bleeding** — Contemporary studies of patients hospitalized with diverticular bleeding indicate that less than 1 percent require surgery [3]. Surgery for the treatment of diverticular bleeding should only be considered as a last resort after all other attempts to identify and treat the bleeding source have failed [2] and the patient remains unstable despite resuscitation. It is extremely important to localize the bleeding source

so that a directed segmental colectomy can be performed. Subtotal colectomy (leaving the rectum) for non-localized, presumed colonic bleeding has a high mortality and complication rate in some but not all studies, although the rebleeding rate is low [36]. Segmental resection without bleeding localization (blind resection) results in a high rate of rebleeding (42 percent in one study), major complications, and mortality [37]. When a diverticular bleeding source has been identified in a patient requiring surgery, there is no need to resect all areas of the colon containing diverticula. Carefully selected patients with severe, recurrent diverticular bleeding may choose to undergo elective (usually segmental) colectomy to reduce the likelihood of future episodes. However, it is important to localize the source of bleeding prior to surgery. (See '[Risk of rebleeding and complications](#)' below.)

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## RISK OF REBLEEDING AND COMPLICATIONS

Although diverticular bleeding tends to stop on its own, up to one-third require an intervention to stop the bleeding, and about 15 percent of patients experience additional bleeding episodes while in the hospital. Patients with diverticular bleeding frequently require endoscopic therapy and supportive care due to the large volume of bleeding and are at high risk of rebleeding. In a study of more than 10,000 patients hospitalized with lower gastrointestinal bleeding of whom 64 percent had diverticular bleeding, endoscopic therapy and surgery were needed for treatment by 37 percent and 0.7 percent, respectively [3]. Blood transfusions were required by 32 percent of patients and 23 percent required  $\geq 4$  units of packed red blood cells. Rebleeding occurred within 30 days in 22 percent of patients and inpatient mortality was 0.2 percent. In another study of 2500 patients, diverticular bleeding recurred during the index hospitalization in 14.7 percent. Overall mortality in patients with lower gastrointestinal bleeding was low (3.2 percent) and very few were directly attributed to bleeding (0.2 percent) [38].

The long-term risk of recurrent diverticular bleeding in a United States cohort of 15,000 patients was 4.7 percent at one year, 8.3 percent at two years, and 15.7 percent at five years. The use of antiplatelet agents increased the risk of recurrent diverticular bleeding [39]. In another study, hypertension and anticoagulant use were additional risk factors for rebleeding [40].

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## SOCIETY GUIDELINE LINKS

Links to society and government-sponsored guidelines from selected countries and regions around the world are provided separately. (See "[Society guideline links: Colonic diverticular disease](#)" and "[Society guideline links: Gastrointestinal bleeding in adults](#)".)

## INFORMATION FOR PATIENTS

UpToDate offers two types of patient education materials, "The Basics" and "Beyond the Basics." The Basics patient education pieces are written in plain language, at the 5<sup>th</sup> to 6<sup>th</sup> grade reading level, and they answer the four or five key questions a patient might have about a given condition. These articles are best for patients who want a general overview and who prefer short, easy-to-read materials. Beyond the Basics patient education pieces are longer, more sophisticated, and more detailed. These articles are written at the 10<sup>th</sup> to 12<sup>th</sup> grade reading level and are best for patients who want in-depth information and are comfortable with some medical jargon.

Here are the patient education articles that are relevant to this topic. We encourage you to print or e-mail these topics to your patients. (You can also locate patient education articles on a variety of subjects by searching on "patient info" and the keyword(s) of interest.)

- Basics topics (see "[Patient education: Diverticulitis \(The Basics\)](#)" and "[Patient education: Bloody stools in adults \(The Basics\)](#)")
- Beyond the Basics topics (see "[Patient education: Diverticular disease \(Beyond the Basics\)](#)" and "[Patient education: Blood in the stool \(rectal bleeding\) in adults \(Beyond the Basics\)](#)")

## SUMMARY AND RECOMMENDATIONS

- **Epidemiology** – Colonic diverticular bleeding is the most common cause of brisk hematochezia (maroon or bright red blood). In Western countries, it is a rare complication in patients with diverticulosis. The exact proportion of patients who have diverticulosis and develop diverticular bleeding is not known since diverticulosis is asymptomatic. (See '[Epidemiology](#)' above.)
- **Clinical manifestations** – Patients with diverticular bleeding typically present with painless, brisk hematochezia. Some patients report bloating, cramping, or the urge to defecate. If the bleeding is severe and ongoing, patients may be tachycardic and hypotensive. (See '[Clinical manifestations](#)' above.)
- **Risk of rebleeding and complications** – Diverticular bleeding tends to be large-volume and usually requires hospitalization. Although bleeding tends to stop on its own, up to one-third require an intervention to stop the bleeding, and approximately 15 percent of patients experience additional bleeding episodes while in the hospital. However, the need



for surgery is rare and mortality rates are low. (See ['Risk of rebleeding and complications'](#) above.)

- **Diagnosis** – In hemodynamically stable patients, colonoscopy is the test of choice to diagnose diverticular bleeding because it can rule out other etiologies, localize the site of bleeding, and provide endoscopic therapy ( [table 2](#)). In patients with severe, ongoing bleeding resulting in hemodynamic instability despite resuscitation, CT angiography can provide a rapid diagnosis of the source without the need for bowel preparation or sedation. CT angiography relies on active bleeding, and therefore, is not appropriate for patients without active, ongoing blood loss. (See ["Approach to acute lower gastrointestinal bleeding in adults"](#), section on ['Diagnostic studies'](#).)
- **Management** – The management of colonic diverticular bleeding includes resuscitation and, often, treatment of the bleeding site. (See ['Triage, supportive care, resuscitation with IV fluids/blood products'](#) above.)
  - **Endoscopic therapy in hemodynamically stable patients** – Colonoscopy can determine the underlying etiology and treat the source of lower gastrointestinal bleeding. In patients with active bleeding or a visible vessel localized to a particular diverticulum during colonoscopy, we recommend endoscopic therapy rather than conservative management (**Grade 1B**). (See ['Endoscopic therapy in hemodynamically stable patients'](#) above.)
  - **Angiography and embolization for unstable patients or failure of endoscopic therapy** – We perform angiography therapy in patients with severe persistent bleeding resulting in hemodynamic instability despite resuscitation who have a bleeding source identified on CT angiography and in patients in whom attempts to stop the bleeding endoscopically are unsuccessful. (See ['Angiography for unstable patients and endoscopic therapy failure'](#) above.) and
  - **Surgical management for refractory bleeding** – Surgery is reserved for patients with diverticular bleeding that cannot be controlled with endoscopic or angiographic therapy, and for whom there is persistent instability despite aggressive resuscitation. (See ['Surgical intervention for refractory bleeding'](#) above.)

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## ACKNOWLEDGMENT

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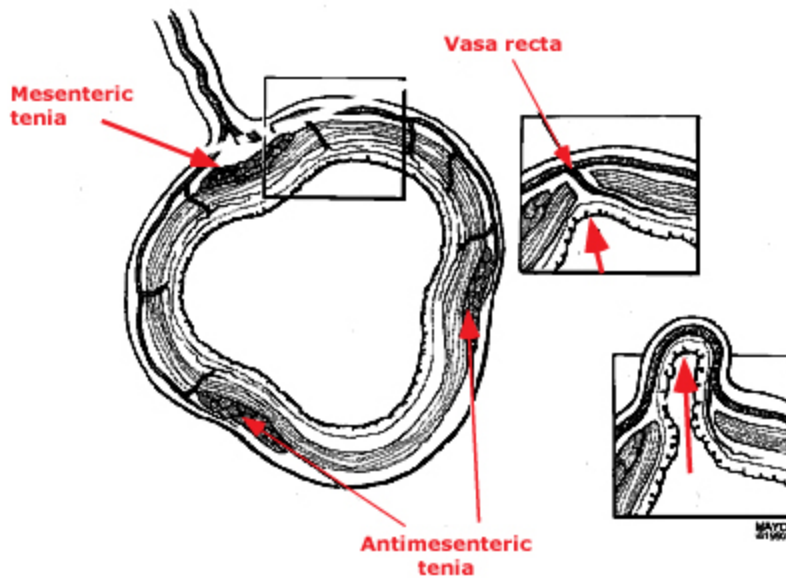
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Topic 2641 Version 32.0

## GRAPHICS

### Location of colonic diverticula within the bowel wall



Diverticula develop at four well-defined points around the circumference of the colon, the sites at which the vasa recta penetrate the circular muscle layer. These vessels enter the wall on each side of the mesenteric taenia and on the mesenteric border of the two antimesenteric taeniae. The insets represent the development of a diverticulum at one such point of weakness.

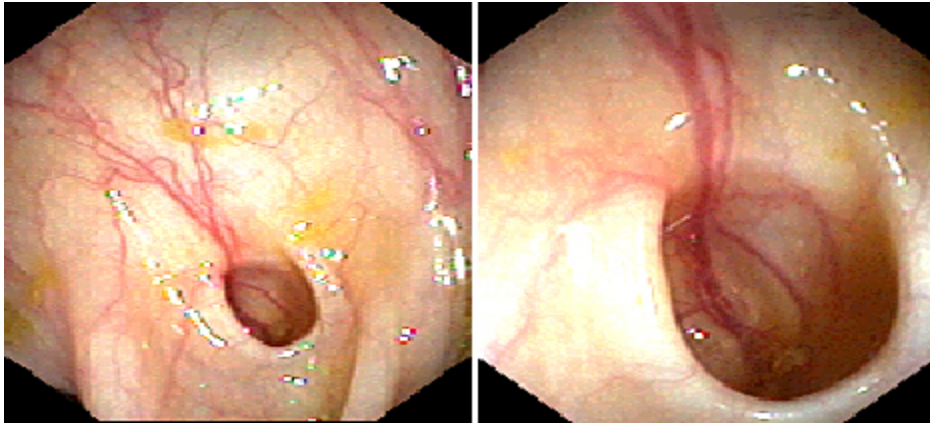
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Graphic 62942 Version 4.0

## Blood vessel within a colonic diverticulum



Endoscopy showing a blood vessel within a diverticulum. The blood vessel is separated from the bowel lumen only by mucosa. Over time, the vessel wall is exposed to injury along its luminal aspect, possibly leading to segmental weakness which predisposes to rupture into the lumen.

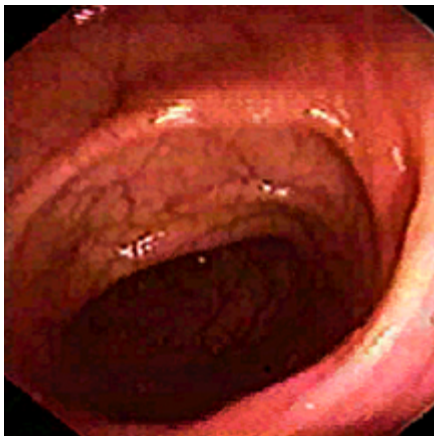
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*Courtesy of James B McGee, MD.*

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Graphic 52254 Version 3.0

## Normal sigmoid colon



Endoscopic appearance of the normal sigmoid colonic mucosa. The fine vasculature is easily visible, and the surface is shiny and smooth. The folds are of normal thickness.

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*Courtesy of James B McGee, MD.*

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Graphic 55563 Version 1.0

## Common causes of lower gastrointestinal bleeding

<b>Vascular</b>
Diverticulosis
Angiodysplasia
Hemorrhoids
Ischemic
Post biopsy or polypectomy
Radiation-induced telangiectasia
<b>Inflammatory</b>
Infectious
Inflammatory bowel disease
Ulcer
<b>Neoplastic</b>
Polyp
Carcinoma

Graphic 58308 Version 5.0

## Microcatheter with extravasation into diverticulum



*Courtesy of Dr. Lisa Strate.*

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Graphic 141227 Version 1.0



## Procedures used for evaluation of lower gastrointestinal bleeding

Technique	Advantages	Disadvantages
Radionuclide imaging	<ul style="list-style-type: none"> <li>Noninvasive</li> <li>Sensitive to low rates of bleeding</li> <li>Can be repeated for intermittent bleeding</li> </ul>	<ul style="list-style-type: none"> <li>Has to be performed during active bleeding</li> <li>Poor localization of bleeding site</li> <li>Not therapeutic</li> <li>Not widely available</li> </ul>
CT angiography	<ul style="list-style-type: none"> <li>Noninvasive</li> <li>Accurately localizes bleeding source</li> <li>Provides anatomic detail</li> <li>Widely available</li> </ul>	<ul style="list-style-type: none"> <li>Has to be performed during active bleeding</li> <li>Not therapeutic</li> <li>Radiation and IV contrast exposure</li> </ul>
Angiography	<ul style="list-style-type: none"> <li>Accurately localizes bleeding source</li> <li>Therapy possible with super-selective embolization</li> <li>Does not require bowel preparation</li> </ul>	<ul style="list-style-type: none"> <li>Has to be performed during active bleeding</li> <li>Potential for serious complications</li> </ul>
Colonoscopy	<ul style="list-style-type: none"> <li>Precise diagnosis and localization regardless of active bleeding or type of lesion</li> <li>Endoscopic therapy is possible</li> </ul>	<ul style="list-style-type: none"> <li>Need colon preparation for optimal visualization</li> <li>Risk of sedation in acutely bleeding patient</li> <li>Definite bleeding source (stigmata) infrequently identified</li> </ul>

CT: Computed tomographic; IV: intravenous.

Graphic 74147 Version 3.0

## Contributor Disclosures

**John H Pemberton, MD** No relevant financial relationship(s) with ineligible companies to disclose. **Lisa Strate, MD, MPH** No relevant financial relationship(s) with ineligible companies to disclose. **John R Saltzman, MD, FACP, FACG, FASGE, AGAF** No relevant financial relationship(s) with ineligible companies to disclose. **Shilpa Grover, MD, MPH, AGAF** No relevant financial relationship(s) with ineligible companies to disclose.

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