Imaging Workup of Acute and Occult Lower Gastrointestinal Bleeding

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KEYWORDS

• Gastrointestinal • Bleed • Acute • Occult • Lower • Radiology • Angiography • Enterography

KEY POINTS

- Lower gastrointestinal bleeding is defined as occurring distal to the ligament of Treitz and presents as hematochezia, melena, or with anemia and positive fecal occult blood test.
- Imaging tests in the workup of acute lower gastrointestinal bleeding include computed tomography (CT) angiography, nuclear medicine scintigraphy, and conventional catheter angiography.
- Imaging tests in the workup of occult lower gastrointestinal bleeding include CT enterography and nuclear medicine Meckel scan.

INTRODUCTION

Lower gastrointestinal (GI) bleeding is a frequent cause for hospital admissions with an annual incidence of approximately 20 to 27 cases per 100,000 persons in the United States.[1] Morbidity and mortality vary according to the underlying cause of the GI bleed, with reported mortality rates of 2% to 20% for lower GI bleeding and as high as 40% for hemodynamically unstable patients.[2]

Lower GI bleeding is defined as bleeding that occurs distal to the ligament of Treitz, with upper GI bleeding occurring proximally. Clinical presentations vary based on the source of the bleed and cause; however, acute lower GI bleeds typically present with hematochezia, noting that secondary to the cathartic effects of blood, a brisk upper GI bleed may present in a similar manner.[3] Causes of lower GI bleeding may be anatomic, such as diverticulosis (33.5%); vascular, such as hemorrhoids (22.5%), angioectasia, or ischemia; neoplastic (12.7%); inflammatory as with inflammatory bowel disease; or infectious.[4] If the workup of the large bowel is negative, then patients are suspected of having a small bowel bleed.

There are several classification schemes used to describe lower GI bleeding related to the duration and severity of the bleed as well as the results of upper and lower endoscopy/imaging. When correlating with the amount of bleeding, lower GI bleeds can be categorized as massive, moderate, or occult. Massive bleeding is defined by the passage of profuse hematochezia with hemodynamic instability. Moderate bleeding reflects hematochezia in hemodynamically stable patients. Occult bleeding refers to the presence of a positive fecal-occult blood test or iron deficiency anemia without another identifiable source and without frank hematochezia.[5] Obscure bleeding refers to patients who have recurrent bleeding after negative endoscopic evaluation and advanced

Disclosure Statement: Nothing to disclose.

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Radiol Clin N Am 56 (2018) 791–804

https://doi.org/10.1016/j.rcl.2018.04.009

radiologic assessment of the small bowel and can be either acute or occult.[2]

WORKUP RECOMMENDATIONS FOR ACUTE LOWER GASTROINTESTINAL BLEEDING

The workup of patients presenting with acute lower GI bleeding involves resuscitation, localizing the site of bleeding, and intervention to stop the source of the bleeding, as appropriate. The main tools of the workup include direct visualization with proctoscopy/colonoscopy and imaging with computed tomography angiography (CTA), nuclear scintigraphy, or angiography. Although surgery was once a necessity for patients with ongoing lower GI bleed, advanced techniques in endoscopy and angiography have improved detection and treatment, with surgery now reserved for cases in which more conservative management has failed.[6]

The clinical presentation of patients during the triaging process as well as the services available at a hospital dictate the order and priority in which tests are used in the workup of an active lower GI bleed.[1] Any patient with hemodynamic instability must first be resuscitated. If endoscopy is available, it is generally the first test preformed; however, there are significant limitations. The colon must first be prepped in order to clear enteric contents and blood, which could obscure the source of bleeding. Even rapid bowel preparations take at least several hours, which may not be possible in patients with ongoing bleeding. Additionally, in some series, colonoscopy detects the source of bleeding in only 13% to 40%.[2] In cases whereby emergent endoscopy is not indicated, patients will typically be sent for an imaging study, such as CTA, nuclear scintigraphy, or catheter angiography, depending on the local availability and clinical expertise. In patients who are clinically stable at presentation, more conservative management is generally indicated, with many patients being worked up with elective endoscopy.[7]

COMPUTED TOMOGRAPHY ANGIOGRAPHY

CTA has excellent sensitivity and specificity for the identification and localization of acute GI bleeds. A meta-analysis by Garcia-Blazquez and colleagues[8] reported a sensitivity of 85.2% and specificity of 92.1% for the detection of acute, active GI bleeds. Yoon and colleagues[9] used arterial phase CTA in 26 patients with massive GI bleeding and reported an overall accuracy of 89%. CTA can detect bleeding rates as low as 0.3 mL/s in in vitro studies.[10] Advantages of CTA include that it is widely available, noninvasive, provides excellent localization, and additionally can provide the cause of the GI bleed. CTA can diagnose diverticular disease, vascular abnormalities (such as angioectasia), tumors, colitis/enteritis, bowel ischemia, and postoperative/iatrogenic causes. Additionally, the arterial phase imaging demonstrates vascular anatomy and any vascular variants. This information can be observed on the source images and reformatted using maximum intensity projections (MIPs) to provide valuable information for the subsequent mesenteric angiography.[2]

Disadvantages of CTA include radiation dose, as it is usually done in 3 phases; however, improvements in CT dose reduction have made this less of an issue than in the past.[11] CTA also requires an intravenous (IV) contrast dose, which is relatively contraindicated in patients with acute renal failure. As with all imaging tests, patients must be actively bleeding at the time of the scan.

CTA for acute GI bleeding is typically preformed as a triphasic study. Enteric contrast is not given as is critical to acquire the examination as quickly as possible in patients with active hemorrhage. A precontrast examination is first acquired using low radiation dose settings. The purpose of the precontrast portion of the examination is to identify any hyperdense enteric contents, such as pills, residual oral contrast, hyperdense stool, and so forth, so they are not confused for contrast extravasation on later phases. Next, at least 100 mL noniodinated contrast is administered intravenously by a power injector at a rate of 4 to 5 mL/s. Automated bolus technique is preferred, with arterial phase obtained 8 to 10 seconds after the attenuation coefficient in the proximal abdominal aorta reaches a threshold of 150 Hounsfield units (HU). Portal venous phase is then acquired approximately 50 seconds after start of the arterial phase.[12]

Computed Tomography Angiography: Findings

Active GI bleeding is manifest by contrast extravasation into the bowel lumen on CTA. The contrast extravasation appears as a blush on arterial phase imaging, which propagates further down the bowel on the portal venous phase due to peristalsis[11] (**Figs. 1** and **2**). If bleeding is arterial, a jet of contrast may be seen. Lower intensity bleeds are often better seen on the portal venous phase, as more time has been allowed for the contrast to accumulate.[13] It is important to look at the precontrast and contrast-enhanced images side by side, as inherently hyperdense intraluminal