Clinical assessment and treatment algorithm for lower gastrointestinal bleeding

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A B S T R A C T

Lower gastrointestinal bleeding (LGIB) is diagnosed in 20% to 30% of all patients presenting with major gastrointestinal (GI) bleeding. Although most patients with acute LGIB stop bleeding spontaneously and have favorable outcomes, morbidity and mortality ranges from 2% to 4%, and is higher in older patients and those with comorbid medical conditions. Common etiologies of LGIB are diverticular bleeding, ischemic colitis, angioectasia bleeding and hemorrhoid. Patients presenting with acute severe hematochezia should undergo a focused evaluation simultaneous with hemodynamic resuscitation. An upper GI bleeding source must be excluded in patients with hematochezia and hemodynamic instability. Colonoscopy following a colon preparation is the initial test of choice in most patients presenting with acute hematochezia and hemodynamic stability.

Keywords: Hemorrhage; Intestines; Therapeutics

Introduction

Lower gastrointestinal bleeding (LGIB) is diagnosed in 20% to 30% of all patients presenting with major gastrointestinal (GI) bleeding.1,2 Compared with acute upper GI bleeding (UGIB) patients, patients with LGIB tend to present with a higher hemoglobin level and are less likely to develop hypotensive shock or require blood transfusions.3 Although most patients with acute LGIB stop bleeding spontaneously and have favorable outcomes, morbidity and mortality ranges from 2% to 4%,4,5 and is higher in older patients and those with comorbid medical conditions.6

Definition of LGIB

LGIB has been defined as bleeding originating distal to the ligament of Treitz. However, since the advent of capsule endoscopy and enteroscopy, small-bowel sources have been placed in the category of midgut bleeding from the small intestine (middle GI bleeding), which is distinct from colonic bleeding in terms of presentation, management, and outcomes.7 Thus, the new definition of LGIB has been proposed as bleeding from a source distal to the ileocecal valve, with hematochezia originating from either the colon or the rectum.8 Acute LGIB is defined as recent bleeding (<3 days) that may result in hemodynamic instability, anemia, and/or the need for blood transfusion. Chronic LGIB is the passage of blood per rectum over a period of several days or longer, and usually implies intermittent or slow loss of blood.3

Etiologies of LGIB

Diverticular bleeding

Diverticular bleeding accounts for 30% to 65% of acute LGIB episodes (Table 1). Colon diverticula are present in up to 30% of patients aged ≥50 years, with the prevalence increasing to approximately 60% in those aged ≥80 years in studies from Western countries.9 In Korea, the prevalence of colonic diverticulosis has increased to 12% in conjunction with the adoption of Western dietary habits, extension of lifespan, and advances in diagnostic modalities.10 Nonsteroidal anti-inflammatory drugs (NSAIDs) increase the risk for diverticular bleeding, while hypertension and anticoagulation may also contribute to severe bleeding.11,12 The clinical presentation of diverticular bleeding is characterized by painless hematochezia. Bleeding resolves spontaneously in 75%
to 80% of patients, but recurs in 25% to 40% within 4 years. The diagnosis of diverticular hemorrhage is presumptive in most patients, and is based on the presence of colon diverticula and the absence of another obvious source of LGIB. A definitive diagnosis is made in approximately 22% of patients who have active bleeding or high-risk stigmata of a visible vessel or clot on colonoscopy. After endoscopic treatment, early rebleeding is uncommon. Late rebleeding may occur from diverticula at a location different from that of the index bleed.

**Ischemic colitis**

Ischemic colitis is the underlying etiology in 1% to 19% of patients with LGIB and most commonly affects elderly patients. Ischemic colitis results from a sudden, often temporary, reduction in mesenteric blood flow secondary to hypoperfusion, vasospasm, or occlusion of the mesenteric vasculature. Ischemic colitis manifests with a wide spectrum of injuries, including reversible colopathy (subepithelial hemorrhage and edema), transient colitis, chronic colitis, stricture, gangrene, and fulminant universal colitis. The typical locations affected by nonocclusive colon ischemia are the splenic flexure and rectosigmoid junction; the rectum usually is spared, because of its dual blood supply. Patients with ischemic colitis often have underlying cardiovascular disease and present with hypotension or hypovolemia, which results in mesenteric hypoperfusion and vasoconstriction. The clinical presentation of ischemic colitis is cramping abdominal pain over the segment of colon involved, followed by a short course of bloody diarrhea. Typical endoscopic findings are submucosal hemorrhage and ulcerations in the colon and a single linear ulcer that runs along the longitudinal axis of the colon on the antimesenteric border (Fig. 1A, 1B). Angiography should be considered in patients with severe ischemic colitis or right-side involvement, when there is suspicion for an underlying thromboembolism or concomitant mesenteric ischemia involving the small bowel. The majority of patients diagnosed with ischemic colitis show improvements with conservative management including intravenous hydration and correction of the underlying etiology, although some with more severe disease require antimicrobials and/or surgical intervention.

**Angioectasia**

Angioectasias, also named angiodysplasias are caused by degenerative changes and chronic intermittent low-grade obstruction in the submucosal vessels. The prevalence of colon angioectasia is 3% to 15% in patients with LGIB. The presence of

| Table 1 Causes of Acute Lower Gastrointestinal Bleeding |
|-------------|------------------|
| Cause                  | Cases (%)                  |
| Diverticulosis          | 30–65                        |
| Ischemic colitis        | 4–20                          |
| Hemorrhoids            | 4–20                          |
| Angioectasias          | 4–15                          |
| Colitis, other         | 3–15                          |
| Colorectal polyps or neoplasms | 2–15                   |
| Postpolypectomy bleeding | 2–7                               |
| Inflammatory bowel disease | 3–5                             |
| Rectal ulcer           | 0–8                           |

Data from the article of Gralnek et al [N Engl J Med. 2017;376:1054-63].

![Fig. 1. Ischemic colitis at sigmoid colon (A, B). Angioectasias at ascending colon (C, D)](image-url)
colonic angioectasia is associated with valvular heart disease, liver cirrhosis, and chronic renal failure, and risk factors for bleeding include advanced age, comorbidities, the presence of multiple angioectasias, and the use of anticoagulants or antiplatelet agents. Patients can present with occult bleeding, melena, or painless intermittent hematochezia. Colonoscopy has a sensitivity of 80% for the detection of angioectasias, and typical endoscopic findings are red, flat lesions, ranging in size from 2 mm to several centimeters, with ectatic blood vessels radiating from a central feeding vessel, predominantly in the cecum and the ascending colon (Fig. 1C, 1D).

Hemorrhoids

The prevalence of hemorrhoidal bleeding has been reported as 2% to 64% in patients presenting with hematochezia. Hemorrhoids are a plexus of dilated arteriovenous vessels that arise from the superior and inferior hemorrhoidal veins; these plexuses are located in the submucosa of the distal rectum and are classified as internal or external, based on their location relative to the dentate line. Patients typically present with painless, intermittent, scant hematochezia characterized by bright red blood on the toilet paper, coating the stool, or dripping into the toilet bowl.

Colorectal neoplasia

Colorectal neoplasia accounts for up to 17% of all etiologies in patients with LGIB and presents more commonly with occult bleeding. In addition to LGIB, symptoms of bowel habit changes and weight loss should raise suspicion for colorectal neoplasia and prompt colonoscopy should be performed. LGIB associated with colorectal neoplasia usually results from surface ulcerations of an advanced tumor. Patients with tumors in the right side of the colon are more likely to present with occult blood loss and iron deficiency anemia, whereas those with left-side tumors more commonly present with hematochezia. Endoscopic treatment for hemostasis is rarely required because bleeding from colorectal neoplasia is slow in the majority of patients.

NSAID use

NSAID use is associated with an increased risk of LGIB, including diverticular bleeding. The prevalence of NSAID use is reported to be as high as 86% in patients with LGIB. The mechanisms involved in the induction of LGIB by NSAIDs are not well understood and may include local mucosal trauma and platelet inhibition in susceptible individuals as well as the concomitant use of warfarin and other antiplatelet agents. Use of NSAIDs can induce NSAID colopathy, which is characterized by colon ulcerations and diaphragm-like strictures, predominantly located in the terminal ileum and right side of the colon.

Miscellaneous Etiologies

Post-polypectomy bleeding has been reported to account for 2% to 8% of acute LGIB. The initial assessment of the patient presenting with presumed acute LGIB should include a focused history including recent polypectomy (Fig. 2). Rectal ulcers have been reported in 8% of patients who present with severe hematochezia, and are an important cause of acute LGIB in patients with critical illness such as end-stage renal disease on hemodialysis, respiratory failure requiring mechanical ventilation, decompensated cirrhosis, or malignancy. Endoscopic findings range from clean-based ulcers (82%) to adherent clots (17%), non-

![Fig. 2. Post-polypectomy bleeding. (A) Polyp at ascending colon, (B) post-polypectomy ulcer, (C) post-polypectomy bleeding at next day, (D) bleeding control with clips.](image)
bleeding visible vessels (33%), and active bleeding (50%). Early rebleeding after endoscopic treatment has been reported in 44% to 48% of patients, and a mortality rate of 33% to 48% has been reported in patients with high-risk stigmata who have multiple comorbidities. 

In radiation proctopathy, LGIB has been reported in 4% to 13% of patients. This disorder is caused by radiation-induced endarteritis obliterans, which results in neovascularization and telangiectasias in the rectum. 

Patients with inflammatory bowel disease commonly present with LGIB. Clinically significant bleeding in Crohn’s disease is more common in patients with colon involvement than in those with isolated small-bowel disease. 

Management

Evaluation

A directed history-taking, physical examination, and laboratory evaluation should be performed at the time of patient presentation with the goal of determining the severity of bleeding, its possible location, and etiology. The history obtained should include the color, amount, frequency, and duration of bleeding and any associated symptoms that may suggest a specific source such as abdominal pain and diarrhea (collitis), and altered bowel habits and weight loss (malignancy). In addition, a targeted history of medications that may influence bleeding risk (NSAIDs, antplatelet agents, and anticoagulants), prior bleeding episodes, recent polypectomy, radiation therapy for prostate or pelvic malignancies, inflammatory bowel disease, and risk factors for colorectal cancer may be useful to determine the potential source of bleeding and guide further management. 

The physical examination should include the measurement of vital signs, and a cardiopulmonary, abdominal, and digital rectal examination should also be performed. Initial laboratory studies should include a complete blood count, serum electrolytes, and coagulation studies, with blood typing and cross-matching. 

Hemodynamic resuscitation

Hematochezia associated with hemodynamic instability and/or suspected ongoing bleeding should receive intravenous fluid resuscitation. In addition, some patients will require blood transfusions. Large observational studies and a meta-analysis of three small trials of UGIB suggest that blood transfusion compared with nontransfusion is associated with an increased risk of rebleeding (10% vs 16%), when compared with a transfusion threshold of 9 g/dL. However, there is no improvement in outcomes of rebleeding or surgery after urgent colonoscopy. 

An urgent colonoscopy is recommended in the evaluation of severe hematochezia and should be performed within 8 to 24 hours of admission. Early performance of colonoscopy increases both its diagnostic yield and the likelihood of a therapeutic intervention, and reduces the duration of hospitalization and cost of care. However, there is no improvement in outcomes of rebleeding or surgery after urgent colonoscopy. 

Colon preparation is important before colonoscopy to improve visualization, increase the diagnostic yield, and reduce the risk of perforation. Thus, once the patient is hemodynamically stable, colonoscopy should be performed after adequate colon cleansing, and unprepared colonoscopy/sigmoidoscopy is not recommended. Polyethylene glycol-based solutions can be administered orally at a rate of approximately 1 L every 30 to 45 minutes until the effluent is free of fecal material. A nasogastric tube can be considered to facilitate colon preparation in patients who are intolerant of oral intake and are at low risk of aspiration. After bowel preparation, colonoscopy should be performed within 1 to 2 hours.

Severe hematochezia

Severe hematochezia associated with hemodynamic instability should lead to consideration of a brisk UGIB source, especially in at-risk patients such as those with a history of peptic ulcer disease or liver disease with portal hypertension and those using antiplatelet or anticoagulant medications. If suspicion for an UGIB source is modest, nasogastric aspirate/lavage can be used to assess possible UGIB. The nasogastric tube can be left in place to facilitate subsequent colon preparation. If the likelihood of UGIB is high, emergent esophagogastroduodenoscopy (EGD) is the test of choice for the evaluation and management of high-risk upper GI lesions, followed by colonoscopy after an upper GI source is ruled out.

Radiographic interventions should be considered in patients with hemodynamically unstable and ongoing bleeding and are therefore unlikely to tolerate bowel preparation and urgent colonoscopy. Angiography localizes a LGIB source in 25% to 70% of exams. A systematic review found that super-selective angiographic embolization achieves immediate hemostasis in 40% to 100% of cases of diverticular bleeding with a rebleeding rate ranging from 0% to 50%. Because angiography relies on active bleeding and has the potential for serious complications, it should be reserved for patients with very brisk, ongoing bleeding.

Colonoscopy should be performed first in hemodynamically stable patients with severe hematochezia. The main advantage of colonoscopy is ability to perform a therapeutic intervention with diagnosis of the underlying lesion. The diagnostic yield of colonoscopy ranges from 45% to 100% in LGIB and is significantly higher than radiologic evaluation with a red blood cell scan and angiography. It is important to carefully inspect the colonic mucosa both on insertion and withdrawal, as culprit lesions often bleed intermittently and may be missed when not actively bleeding. The endoscopist should intubate the terminal ileum to rule out proximal blood suggestive of a small bowel lesion. An adult or pediatric colonoscope with a large working channel (at least 3.3 mm) should be used because the larger working channel facilitates suctioning of blood, clots, and residual stool, and allows for the passage of large diameter (e.g., 10 Fr) endoscopic hemostasis tools. In addition, the use of a water-jet irrigation device (foot pedal controlled by the endoscopist) is recommended to facilitate removal of adherent material and residue from the colonic mucosa.

Seevent intermittent hematochezia

Chronic intermittent passage of small amounts of blood per rectum is the most common pattern of LGIB and usually is caused...
by an anorectal or distal colon source of bleeding. A digital rectal examination and flexible sigmoidoscopy may be sufficient for the evaluation of average risk patients with minimal bright red bleeding per rectum. The diagnostic yield of flexible sigmoidoscopy ranges up to 58% in patients with LGIB, and colonoscopy should be pursued in the absence of a definitive source of bleeding on flexible sigmoidoscopy, patients aged > 50 years, the presence of iron deficiency anemia, risk factors for colorectal neoplasia, or alarm symptoms of weight loss or bowel habit changes.

**Melena**

In the evaluation of melena, the majority of patients have UGIB and EGD should be the initial test. However, melena also may result from slow bleeding emanating from the colon or small bowel. Therefore, if there are negative results on EGD, colonoscopy should be performed. Persistent melena after negative results with bidirectional endoscopy may warrant small-bowel endoscopy for evaluation of occult GI bleeding.

**Conclusion**

A management approach for patients presenting with acute LGIB is outlined in Fig. 3. To summarize, patients presenting with acute severe hematochezia should undergo a focused evaluation simultaneous with hemodynamic resuscitation. A UGIB source must be excluded in patients with hematochezia and hemodynamic instability. Colonoscopy following a colon preparation is the initial test of choice in most patients presenting with acute hematochezia and hemodynamic stability.

**Conflicts of Interest**

No potential conflict of interest relevant to this article was reported.

**References**


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