Chapter 11
Urgent Workup of Lower Gastrointestinal Bleeding

Megan Turner and Leila Mureebe

Introduction

Melena and bright red blood per rectum (hematochezia) are common presentations of gastrointestinal bleeding. Upper gastrointestinal bleeding (UGIB) is the most common etiology of a lower gastrointestinal bleed (LGIB), ultimately encompassing 80 % of blood per rectum (BPR). The remaining 20 % originate distal to the ligament of Treitz [1]. The vast majority of these situations arise in the colon; a smaller proportion from the anus and rectum; a significant minority originate in the small bowel [1, 2]. As blood moves through the bowel, hematin becomes oxidized and darkens, mixing with intestinal contents, and emerging as melena. The appearance of bright red blood per rectum can be attributable either to fast transit time as seen brisk bleeding, or a distal source. The annual incidence of LGIB is approximately 20 cases per 100,000 per year in Western countries [3] with the overall mortality rate reported as 3 %, similar to UGIB [1, 3]. Prognosis is favorable given the fact that most LGIB spontaneously cease [2], however negative prognostic factors include advanced age, high transfusion requirements, comorbid factors, and hospitalization at the onset of the bleeding episode [1, 4–6]. Velayos et al. described an initial hematocrit of less than 35 %, abnormal vital signs, and gross blood on rectal exam as three independent risk factors for poor outcome [1]. As in UGIB, approximately 80 % of LGIB spontaneously cease. this chapter addresses the urgent management of patients who require inpatient evaluation and intervention.

M. Turner, M.D. • L. Mureebe, M.D., M.P.H., F.A.C.S. (✉)
Department of Surgery, Duke University Medical Center, Durham, NC, USA
e-mail: Leila.Mureebe@duke.edu

A.D. Pryor et al. (eds.), *Gastrointestinal Bleeding*,
DOI 10.1007/978-3-319-40646-6_11

Table 11.1 Common etiologies of LGIB by age (Edelman and Sugawa [1]; Elta [9]; Leung and Wong [2]; Zuckerman and Prakash [3])

Infants/toddlers	Children/teenagers	Adults	Older adults
Milk allergy	Anal fissures	Diverticulosis	Angiodysplasia
Necrotizing enterocolitis	Polyps	Upper GI source	Diverticulosis
Volvulus	Inflammatory bowel disease	Neoplasm/polyps	Neoplasm/polyps
Anal fissure	Intussusception	Inflammatory bowel disease	Upper GI source
Intussusception	Infectious colitis	Anorectal disease	Anorectal disease
Hirschsprung disease	Meckel diverticulum	Iatrogenic (radiation proctitis, post-polypectomy)	Iatrogenic (radiation proctitis, post-polypectomy)
Meckel diverticulum	Angiodysplasia	Angiodysplasia	Mesenteric ischemia
	Henoch–Schoenlein purpura		Inflammatory bowel disease
	Hemolytic uremic syndrome		

Etiology

The etiology of LGIB varies widely by age, and the epidemiology of the disease must be considered in arriving at the correct diagnosis (Table 11.1). The most common causes of LGIB in adults are colonic diverticulosis [2, 3, 5], benign anorectal disease, inflammatory bowel disease, malignancy, and angiodysplasia [5]. Rarer causes include infection, ischemia, iatrogenic, and aortoenteric fistulous disease. In as many as 10–35 % of cases a source of bleeding is never identified [2, 5, 6].

Diverticular Disease

Diverticular disease of the colon is the most common cause of LGIB in adults [1, 2]. Diverticula are outpouchings of colonic mucosa through the muscularis and serosa, most commonly found on the mesenteric side of the colon at the site of penetrating blood vessels, vasa recta, where the colonic wall is weakest. A propensity towards developing diverticular disease include advancing age, with estimates of greater than 50 % of adults over the age of 60 in the United States having diverticular disease, with up to 17 % of those affected experience bleeding [6]. A Western diet, low in fiber and high in saturated fats, is associated with development of diverticula. Thirty percent of LGIB are attributed to diverticula with bleeding requiring urgent evaluation and intervention as described later in the chapter [2, 7].

Benign Anorectal Disease

Hemorrhoids are a common problem with greater than 30 % of people over the age of 50 having hemorrhoids on exam, regardless of symptoms. Bleeding can range in severity from a minor inconvenience to a source of massive hemorrhage. 20 % of instances of BPR requiring intervention are attributable to hemorrhoidal bleeding [2, 8]. Internal hemorrhoids are painless and intermittent bleeding is often the only symptom. Bleeding can also be a symptom of external hemorrhoids; however pain and itching are predominant symptoms. In the evaluation of blood per rectum the identification of hemorrhoids should not provide diagnostic satisfaction as hemorrhoids remain common in the presence of additional pathology, and a thorough evaluation of the remainder of the colon should be undertaken. Anal fissures can also present with blood per rectum; however this is predominantly scant bleeding associated with pain on defecation.

Inflammatory Bowel Disease

Inflammatory bowel disease (IBD), inclusive of ulcerative colitis and Crohn's disease, is associated with LGIB, although bleeding is a rare complication of these diseases. Ulcerative colitis is isolated to the colon and can present with profuse bleeding. Crohn's disease affects the mucosa along the entire gastrointestinal tract, and while bleeding is less common overall, it presents more severely than bleeding from ulcerative colitis. Patients with LGIB from inflammatory bowel disease is rare, with approximately 2 % with bleeding requiring intervention [9].

Malignancy

Neoplasm must always be part of the differential diagnosis when considering a source of blood loss per rectum, as cancers may bleed from surface erosions or ulcerations. This bleeding is usually characterized as scant and low volume located predominantly within the colon or rectum. However of all patients requiring intervention for LGIB, 12 % percent are associated with a neoplastic lesion [2].

Arteriovenous Malformation

With aging, the presence of angiodysplasia, or arteriovenous malformations (AVM), increases, specifically within the colon [6]. AVM are vascular anomalies of the gastrointestinal tract characterized by dilated and tortuous submucosal vessels. AVM can be congenital, but more often angiodysplasias develop over time from chronic venous obstruction, chronic mucosal ischemia, or as a complication of cardiopulmonary or vascular comorbidities [10].

Rarer Causes

A broad differential for LGIB includes infectious causes, ischemia, and iatrogenic causes. Infectious colitis can present as blood per rectum, most commonly seen with *Escherichia coli 0157H7*, *salmonella*, *shigella* and *Clostridium difficile* bacterial infections and occasionally cytomegalovirus. These patients require urgent intervention.

Iatrogenic LGIB are most common after procedures or clinical irradiation. Significant bleeding following an endoscopic polypectomy can occur at a median of five days, with overall rates of post-polypectomy bleeding varying from 0.3 to 6% [11]. Although LGIB due to radiation may also present as LGIB, this incidence is decreasing due to improved radiation precision in the management of pelvic cancers. Radiation proctitis affects approximately 6% of patients treated with brachytherapy for prostate cancer [12]. These patients are typically treated with topical therapies and do not require endoscopic therapies, although a small subset ultimately require operative intervention [13].

Mesenteric ischemia and ischemic colitis are infrequent causes of LGIB. In mesenteric ischemia, blood per rectum is a late and ominous finding. With ischemic colitis, bleeding is typically scant and hemodynamically insignificant. These events can be chronic, acute, or iatrogenic as determined by the history and physical exam. In critically ill patients, acute mesenteric ischemia can be a result of shock and a low-flow state to the intestine. Evaluation and management of mesenteric ischemia follows algorithms for management of the acute abdomen, and for nontoxic ischemic colitis includes nonurgent colonoscopy, rarely requiring urgent endoscopic intervention, with treatment directed at the underlying cause.

Resuscitation and Stabilization for Massive LGIB

A massive, acute LGIB is a life-threatening emergency defined by a transfusion requirement of more than four units of blood in a 24-h period with hemodynamic instability. Patients with massive hemorrhage present with shock, hemodynamic instability, precipitously dropping hemoglobin levels, and immediate transfusion requirements [1]. Hemorrhage that does not spontaneously resolve in less than 3 days or that recurs after initial stabilization are also considered significant LGIB. Fortunately, most cases of are mild to moderate.

The critical care principles for patients in hemorrhagic shock provide an evaluation and treatment foundation for patients with massive LGIB. Assessment and securing of the airway, confirmation of breathing and circulation are paramount, followed by establishing large-bore peripheral intravenous access, monitoring of hemodynamics, and release of emergency blood products. A nasogastric tube is placed and the stomach lavaged [14]. If bloody or coffee ground material is aspirated, the evaluation and intervention algorithm for UGIB is initiated. The aspira-

tion of bilious material confirms bleeding distal to the ligament of Treitz (LGIB); aspiration of clear fluid favors a distal source, but does not definitively rule out UGIB and a combination of approaches may be more appropriate in these patients.

As resuscitation is initiated, important information to discern with a detailed history and physical examination includes a history of prior GI bleeds, the use of anticoagulants or nonsteroidal anti-inflammatory drugs, a history of thrombotic or thrombophilic disorders, and prior interventions and operations. Essential laboratory investigations include a complete blood count, arterial blood gas, electrolytes, coagulation screening, and type and cross-match in anticipation of blood product transfusion. Physical exam should include cardiovascular pulmonary exam, abdominal exam, digital rectal exam, and anoscopy or rigid proctoscopy.

Diagnostic Modalities

Once the diagnosis of LGIB is suspected, three urgent diagnostic modalities are available for further evaluation, although controversy still exists regarding the ideal testing algorithm (Fig. 11.1). The algorithm for colonoscopy, arteriography, and radionucleotide scintigraphy is largely contingent on the rate of bleeding, but other considerations include local resources and availability. For exsanguinating hemorrhage, arteriography is most appropriate, for profuse but less severe hemorrhage urgent colonoscopy, and for slow or intermittent hemorrhage radionucleotide scintigraphy followed by colonoscopy. Operative interventions are outlined based on the details obtained with each evaluation.

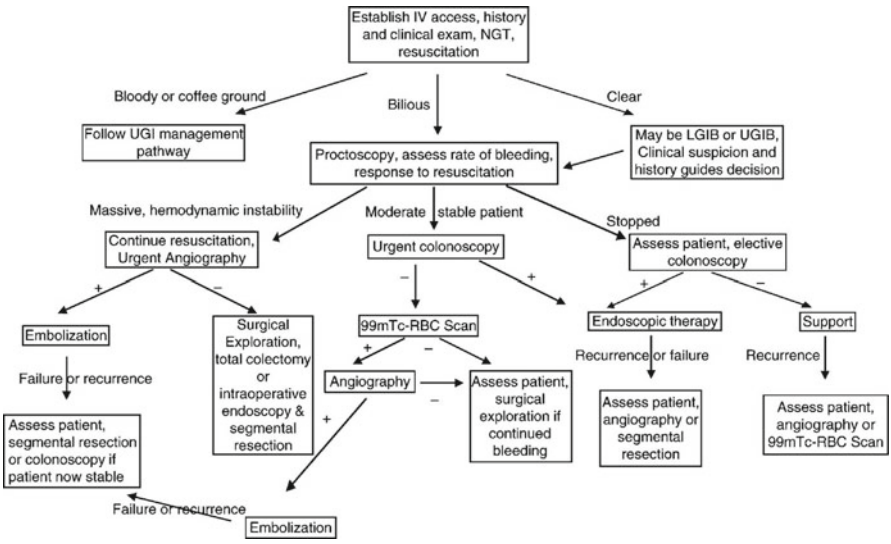

Fig. 11.1 Suggested workup and treatment algorithm for lower gastrointestinal bleeding

Urgent Colonoscopy

In patients where profuse bleeding does not cease, or in patients where rebleeding recurs early, urgent colonoscopy after a rapid bowel preparation is the appropriate diagnostic modality. Endoscopic stigmata of bleeding include visualization of active bleeding, visible vessels, and adherent clot [7]. Early colonoscopy, within 12–48 h of admission, has a higher diagnostic yield and lower complication rate than arteriography, results in shorter length of stay, and avoids further surgical intervention in those patients who respond appropriately to initial resuscitation efforts [6, 7, 15]. This is contrasted to the historical opinion that colonoscopy is of little yield in a briskly bleeding patient with an unprepared colon because of inadequate visualization.

Colonoscopy is both a diagnostic and a therapeutic tool. Bowel preparation should be given via nasogastric tube prior to endoscopy for improved visualization of the lesion. Colonoscopy provides direct visualization of the colonic mucosa and the capability for simultaneous treatment of bleeding via endoscopic clipping, epinephrine injection, thermal therapy, and other hemostatic techniques are in development. However, it is uncommon to identify a bleeding vessel or stigmata of recent bleeding, such as adherent clot. More often, there is a presumed area of concern that can be intervened upon (Fig. 11.2). In cases where endoscopic intervention is not effective in stopping the hemorrhage, the area of bleeding can be marked or tattooed in planning for surgical intervention and this should be performed at the area of concern in the rare event of recurrent hemorrhage. The American Society for Gastrointestinal Endoscopy guidelines for LGIB includes early colonoscopy [16].

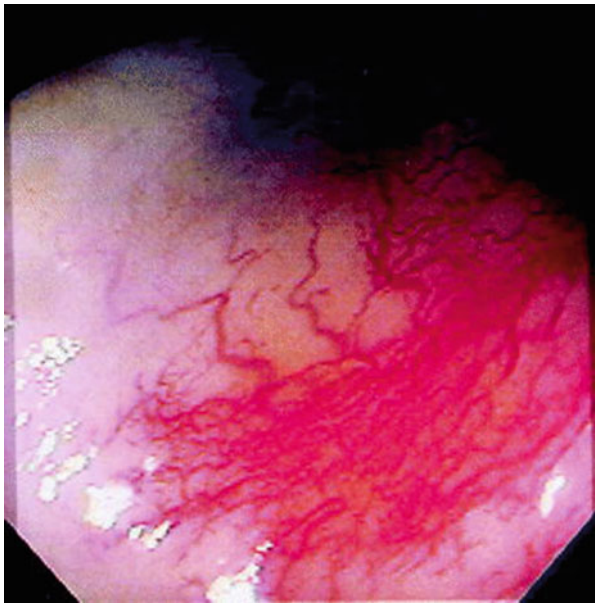

Fig. 11.2 Arteriovenous malformation, no signs of active or recent stigmata of bleeding (courtesy of John Migaly, M.D., Duke University Medical Center, Durham, NC)

While commonly performed, colonoscopy is an invasive study that is not without risk. Perforation occurs in 1 in 1000 colonoscopies and can require hospital admission and surgical resection. The utility of colonoscopy is operator dependent, and urgently recruiting a skilled endoscopist may be difficult. If colonoscopy reveals a bleeding mass, biopsies should be taken of the mass for pathologic diagnosis, and a full oncologic workup is indicated. Further disadvantages to colonoscopy include poor diagnostic yield in brisk bleeds due to poor visualization and inability to detect small bowel sources. All patients with LGIB that have resolved spontaneously should have a semi-elective colonoscopy after thorough preparation of the bowel to identify potential diverticula, AVMs, and neoplasm. In massive ongoing bleeding that obscures diagnostics with colonoscopy, arteriography, and prompt surgical consultation are appropriate.

Urgent Arteriography

Arteriography for rapid LGIB is both diagnostic and potentially therapeutic; it is useful in the urgent setting and in brisk to hemorrhagic bleeding. In hemodynamically unstable patients who have high transfusion requirements of greater than four units of blood, urgent arteriography is preferred over colonoscopy [16]. For a bleeding vessel to be detectible during a normal, non-provocative angiography, it must bleed at a rate of at least 0.5 mL/min [14]. Arteriography must not impede resuscitation efforts.

Once a bleeding vessel or AVM is identified through angiography, there are several options for treatment (Fig. 11.3). Traditionally, embolization was used in UGIB sources, but avoided in LGIB due to of the risk of bowel infarction. However, improved technology has decreased this risk, embolization has proven to be a safe and effective mechanism for management of LGIB. It currently is the preferred therapy compared to the historic vasopressin infusion [17] (Fig. 11.4) which is effective in stopping a LGIB, but requires several days of femoral artery catheter placement and the potential complications that arise from this. A second appropriate use of arteriography is in a patient whom has undergone colonoscopy localizing the area of hemorrhage, but experiences recurrent bleeding despite endoscopic treatment. A second colonoscopy with repeat endoscopic treatment is within the standard of care, as is arteriography prior to proceeding to surgical intervention for these difficult cases [16].

Arteriography is an invasive procedure with risks including contrast-induced nephropathy and injury during arterial access. As in colonoscopy, the success of both diagnosis and therapy can be operator dependent. In cases where endoscopic therapy is not effective in controlling the bleeding, angiography provides a more detailed location of the hemorrhage for surgical intervention. Additionally, angiography can detect rare bleeding sources in the small bowel. However, angiography is not as effective as direct visualization in differentiating the cause of bleeding (Fig. 11.5).

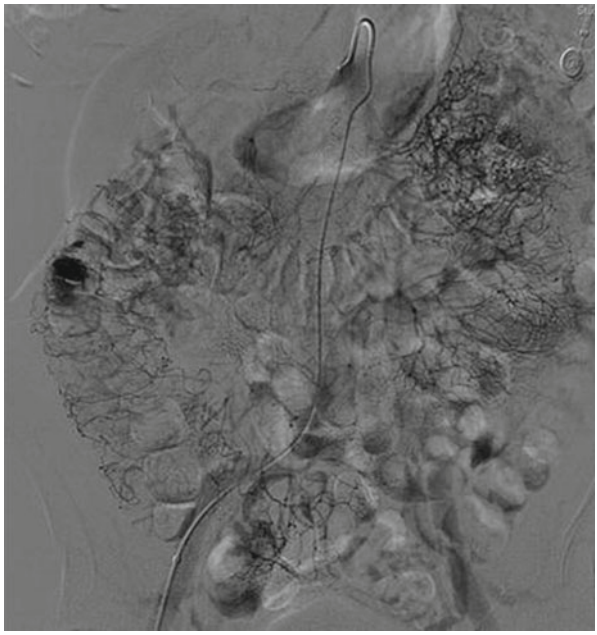

Fig. 11.3 Superior mesenteric angiography positive for right colonic bleeding

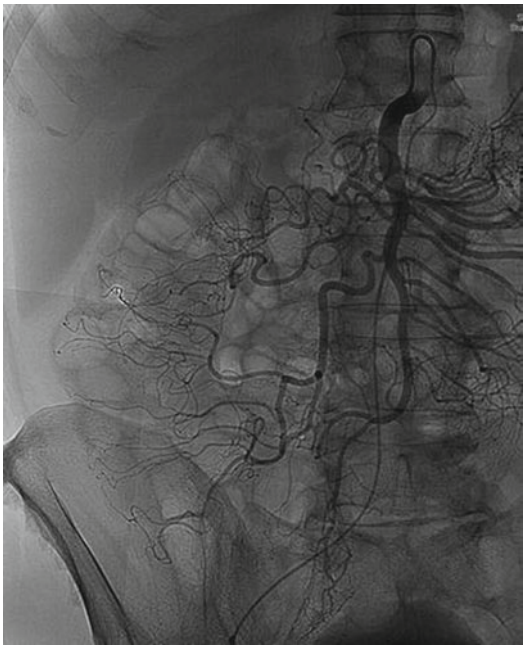

Fig. 11.4 Superior mesenteric angiography for the same patient in Fig. 11.3 after embolization with coils

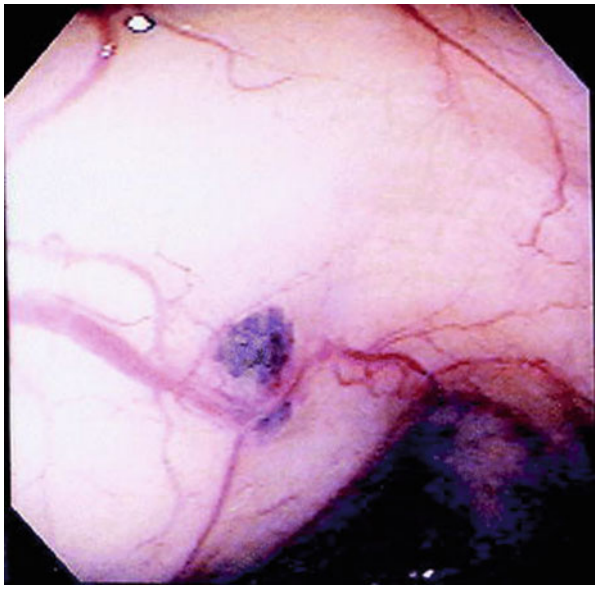

Fig. 11.5 Venous ectasia (courtesy of John Migaly, M.D., Duke University Medical Center, Durham, NC)

Slower bleeds or bleeds that have stopped, even temporarily, will not be visualized on an angiogram. There are provocative maneuvers that can be performed during the examination to identify occult bleeding, but a tagged red blood cell scan can be of utility in these scenarios.

Urgent Tagged Red Blood Cell Scan

Radionucleotide scintigraphy is an appropriate diagnostic modality for localizing slow or intermittent hemorrhage [14, 16]. Technetium 99m-labeled red blood cell scintigraphy is the most widely available method. This test requires radiolabeling the patients own blood ex vivo and infusing it, or using an in vivo labeling kit. The labeled red blood cells are resident for roughly 24 h, and repeat scanning during intermittent bleeding is possible. Injection does not have to occur during a period of active hemorrhage. Delayed images are taken at 1-h intervals and can detect blood pooling from occult locations not initially detected. Radionucleotide scintigraphy is relatively non-invasive. It can localize lower volume and intermittent bleeding as has a limited risk profile compared to angiography and colonoscopy There are several limitations to these studies as well. it is rarely sufficient for definitive diagnosis, and has no capacity for intervention requiring adjunctive subsequent colonoscopy or angiography

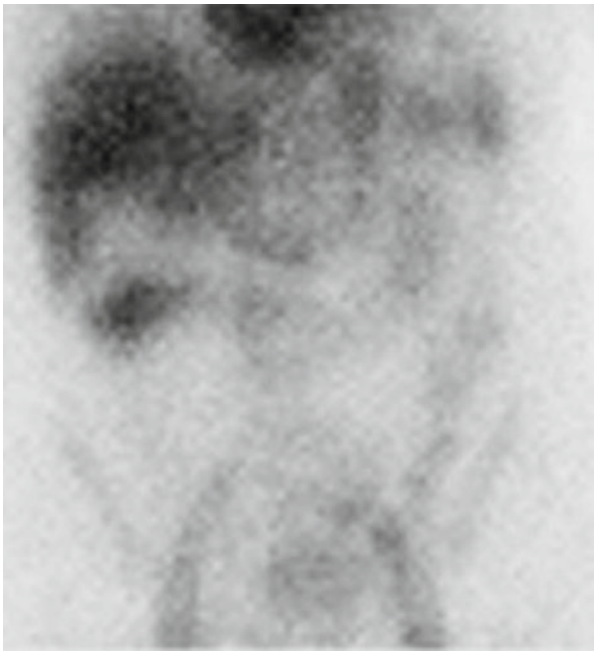

Fig. 11.6 Technetium 99m-labeled erythrocyte scintigraphy positive for bleeding in the area of the hepatic flexure

Technetium 99m-labeled erythrocyte scintigraphy can detect hemorrhage at rates as low as 0.1 mL/min, thus can be more sensitive than angiography in slower bleeds. False-positive studies may lead to inappropriate surgery, and false negatives lead to diagnostic delays [5, 18] (Fig. 11.6). For most surgeons, an operation is rarely planned solely on the results of 99mTc-labeled erythrocyte scintigraphy [14]. In light of low resolution, it is generally not recommended that segmental resection be performed solely on the basis of scintigraphy results. Its use is limited in the urgent setting and should be implemented based on clinical judgment for an individual patient who may not be a suitable candidate for either colonoscopy or angiography.

Summary

Blood per rectum is a common patient presentation with a diverse etiology and broad spectrum of urgency. While most bleeding ceases spontaneously and does not recur, an understanding of critical care principles for stabilization of the hemorrhaging patient, diagnostic algorithms, and potential interventions are important concepts for all providers. Ensuring follow-up is paramount for the medical and surgical management of underlying pathology leading to the bleeding episode.

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