Review Article

DIAGNOSIS AND TREATMENT OF ACUTE LOWER GASTROINTESTINAL BLEEDING

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ABSTRACT

Lower gastrointestinal (LGI) bleeding is a common clinical problem for which multiple diagnostic tests and therapeutic interventions have been developed but no optimal approach has been established. Acute LGI bleeding presents a difficult clinical challenge. Initial attention must always be directed at resuscitation. Endoscopy and angiography may offer accurate diagnosis and therapeutic interventions in most cases. Scintigraphy is useful for the detection of the bleeding site as well as for the identification of patients for further angiographic intervention in cases where the hemorrhage is ongoing. Although the least invasive effective solution to the bleeding problem is generally the best, emergency undirected surgery may be necessary in some patients. In that case, subtotal colectomy can be done with acceptable morbidity and mortality rates. If the bleeding site is identified, segmentary resection is preferred in the surgical treatment of LGI bleeding.

Key Words: Lower gastrointestinal bleeding, Diverticulosis, Angiodysplasia, Colonoscopy, Scintigraphy, Angiography, Colectomy.

INTRODUCTION

Gastrointestinal bleeding is divided into upper and lower sources. Lower gastrointestinal bleeding (LGI) is defined as hemorrhage arising distal to the ligament of Treitz. The source of bleeding is the colon in more than 95% of cases, with the remaining 5% arising from small bowel sites (1). A variety of disorders are associated with LGI bleeding, however diverticulosis and angiodysplasias are the most common. The severity of LGI bleeding ranges from occult blood loss to massive hemorrhage and shock. This article focuses on the presentation, diagnosis, and management of acute LGI bleeding.

Definitions and Incidence

If there is a need of 3 to 5 units of blood over 24 hours to maintain the patient's stability, the bleeding is considered as massive (2). The origin of acute LGI bleeding is closely associated with the patient's age, with a mean age of 65 (63-77) years (3,4). An upper gastrointestinal source may be responsible in approximately 10% of patients presenting with massive hematochezia (5).

Eighty percent of acute bleeding episodes stop spontaneously; however, bleeding is recurrent in 25% of patients (6). Despite the refinements in diagnostic techniques, no source of bleeding is identified in 8% to 12% of cases (7,8). Acute LGI

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bleeding has an annual hospitalization rate of 20.5-27 per 100.000 (9-11). The incidence increases with age, with a greater than 200-fold increase from the 20s to the 80s (11). This rise in incidence most likely represents the increasing prevalence of colonic diverticulosis and angiodysplasia with age (12). The reported mortality rate is 2% to 4% in patients with acute LGI bleeding (9).

Initial Evaluation

The most important step in the initial evaluation of the bleeding patient is assessment of the severity of blood loss so that adequate resuscitation can be performed. The extent of bleeding is often clear on physical examination. Postural hypotension alone suggests a 20% blood volume loss, whereas pallor, hypotension, and tachycardia reflect a 30% to 40% blood volume loss (3). While the patient is being resuscitated, a diagnostic evaluation should be started. This includes a thorough history and physical examination that may be helpful determining the source of the bleeding. One should remember that it is critical to adequately resuscitate any patient with acute LGI bleeding before any definitive diagnostic or therapeutic intervention is performed (3). A nasogastric aspirate should be performed to rule out an upper GI source of bleeding.

The history often suggests an etiology. Hematochezia, passage of bloody stool, blood, or blood clots from the rectum, is the major symptom of patients with acute LGI bleeding. Melena is sticky, black, foul-smelling stool that results from bacterial degradation of hemoglobin (13). It indicates a bleeding source proximal to the ligament of Treitz, but can result from bleeding in the small intestine or proximal colon. Melena is often confused with clotted blood; however, melena is black and does not turn toilet water red, whereas clotted blood does.

Abdominal pain may result from ischemic bowel, inflammatory bowel disease (IBD), or ruptured aortic aneurysm (3). Painless massive bleeding is most characteristic of vascular bleeding from diverticula, angiodysplasia, or hemorrhoids. Bloody diarrhea may suggest IBD or an infectious origin, whereas bleeding with rectal pain is seen with anal fissures, hemorrhoids, and rectal ulcers. A history of severe constipation should raise the possibility of a stercoral ulcer, and a recent colonoscopic polypectomy suggests postpolypectomy-bleeding (9). Aspirin or nonsteroidal anti-inflammatory drug (NSAID) use is strongly associated with LGI bleeding, particularly diverticular bleeding (9).

ETIOLOGY

Diverticulosis and angiodysplasias are the most common causes of acute LGI bleeding. The other less frequent causes are shown in Table 1.

Table I.: Etiology of acute LGI bleeding.

A. Frequent causes
1. Diverticulosis
2. Angiodysplasias
B. Less frequent causes
1. Solitary rectal ulcer syndrome
2. Colonic varices
3. Portal colopaty
4. Small bowel diverticula
5. Meckel's diverticulum
6. Dieulafoy lesion of the colon and small intestine
7. Colitis
8. Colorectal tumors

Diverticular Disease

Colonic diverticula are common defects of the large bowel wall acquired with aging. The existence of colonic diverticula has been recognized since the early 19th century, when they were regarded as pathologic findings of little clinical significance (14). The probable reasons for the increase of its prevalence during the last two centuries are the changes in the western diet and the longer mean lifetime, long enough to acquire a disorder principally associated with advancing age. Until the 1950s, physicians recognized diverticula to be an important source of LGI bleeding (14).

Before the introduction of colonoscopy, diverticulosis was thought to be the most frequent cause of severe LGI bleeding in older people (15-17). In several studies, urgent colonoscopy after thorough removal of blood and stool from the colon indicated that diverticular

hemorrhage was the second most common diagnosis, after colonic angioma, among elderly patients who were hospitalized because of very severe ongoing hematochezia (16,17). Improvements in endoscopic technology have made it possible for endoscopists not only to diagnose sources of bleeding accurately but also to achieve hemostasis of diverticula with active bleeding, visible vessels, and adherent clots and other bleeding sites (16,18).

As mentioned above, the prevalence of diverticulosis is related to the patient's age. It is present in more than 50% of persons over 60 years old but in only 1% to 2% of persons younger than 30 (19,20). It remains the most common cause of acute LGI bleeding, although some studies have found angiodysplasia to be a more common cause in the elderly (7,20).

Colonic diverticula are pseudodiverticula, because their walls do not contain all the layers of the normal colonic wall (14). They do not arise randomly around the circumference of the colon but originate in four distinct rows that correspond to the four sites of penetration of the major branches of the vasa recta. These sites are one each side of the mesenteric tenia and one close to each mesenteric side of the two antimesenteric tenia (14). Bleeding results from arterial rupture into the diverticular sac at this penetration sites of nutrient vessels (21,22). Rupture did not occur circumferentially but always asymmetrically toward the diverticulum itself, resulting in LGI hemorrhage rather than bleeding into the peritoneal cavity (14). Although erosion of the vessel may be the result of stercoral trauma, it is not caused by inflammation (23,24). Significant diverticular bleeding occurs in only 3% to 5% of patients with diverticulosis (3). It is not a cause of occult bleeding and diverticulitis is rarely associated with significant bleeding.

Colonic diverticula occur most often in the distal colon. Ninety percent of patients with diverticulosis have involvement of the sigmoid colon, whereas only 15% in the cecum and ascending colon (14). However, despite this difference, 50% to 70% of bleeding diverticula occur in the right colon (25). Even though it has not been clearly demonstrated yet, the reason for this is suggested to be that right-sided diverticula have wider necks and domes than left-sided diverticula (3).

Diverticular disease is most commonly seen in the older western people regardless of ethnic background (26). The prevalence of the disease linearly increases with advancing age, such that approximately 5% of persons in the 5th decade of life and more than 50% of individuals in the 9th decade of life are affected (14). The disorder is uncommon in Asia and Africa, occurring in less than 1% of the population (14).

Bleeding from diverticula is usually sudden in onset, painless, and massive. Bleeding most often occurs from a single diverticula and stops spontaneously in 80% to 90% of patients, although in 10% to 25% it will recur (7,20).

A deficiency of dietary fiber is suggested as one of the factors that affects the difference in the occurrence of diverticulosis (27). Burkitt (27) hypothesized that this may explain why the disease is seen more commonly in western populations who consume a diet high in refined carbohydrates and low in vegetable fiber. On the other hand, it was shown that the prevalence of diverticulosis in vegetarians is one third that of a control population eating a conventional diet (28). Another impressive observation is the fact that only humans whose diets contain lower vegetable fiber than those of the other herbivores develop colonic diverticula (14). A low-fiber diet may reduce the amount of fecal residue and prolong fecal transit time with increased colonic muscle contraction, producing segmentation of the bowel into short compartments with elevated intraluminal pressure (14). Over time, abnormally high pressure causes formation of pulsion diverticula of the sort described above. Moreover, Wynne-Jones (29) has suggested that diverticulosis is the result of elevated intraluminal pressure probably due to reluctance of western people to the pass flatus in public.

Angiodysplasia

Angiodysplasias, also referred to as vascular ectasias of the colon or arteriovenous malformations, are the most commonly seen vascular abnormalities of the gastrointestinal tract (14). This vascular entity does not relate to other less common vascular lesions such as hemangiomas, congenital arteriovenous

malformations, and the telengiectasias of the Osler-Weber-Rendu syndrome.

Angiodysplasias are specific mucosal vascular ectasias that develop as a degenerative process of aging and result from the chronic low-grade obstruction of submucosal veins. Normal intermittent distension of the cecum and right colon causes recurrent obstruction to venous outflow where veins penetrate the muscularis propria layer of the colonic wall. According to another less widely accepted theory, they result from the chronic hypoxia or hypoperfusion of the mucosa (3).

A concept of the development of vascular ectasias, proposed by Boley and co-workers (30), explains their exclusive occurrence in the right colon with Laplace's law. The right colon has the largest luminal diameter and the highest resting wall tension, so that the pressure difference between the bowel lumen and the peritoneal cavity is highest at this site of the colon. Repeated episodes of colonic distension cause transient increases in both intraluminal pressure and size, and result in increased wall tension. This increase causes an obstruction of submucosal venous outflow.

The prevalence of angiodysplasia is associated with aging. It can be found in more than 25% of asymptomatic individuals over age 60 (30). It occurs with equal frequency in men and in women (14).

Hemorrhage from angiodysplasia is usually subacute and recurrent; however, 15% of cases present with massive hemorrhage (14). The nature and degree of bleeding often varies in a single patient from one episode to another. In more than 90% of cases, bleeding stops spontaneously (5,9).

Less Frequent Causes of LGI Bleeding

Solitary Rectal Ulcer Syndrome

Solitary rectal ulcer is a chronic benign condition characterized by single or multiple shallow ulcers surrounded by a hyperemic margin and located in the majority of the cases on the anterior or anterolateral rectal wall. It was first described by Cruveilheir in 1842 (31). The major symptoms of solitary rectal ulcer syndrome are rectal bleeding, the passage of mucus per rectum, and tenesmus (32). Several cases of massive LGI bleeding have been reported (33). Sigmoidoscopy and biopsy are essential for diagnosis. Conservative treatment is generally indicated initially and surgical therapy may be considered in selected cases (31). However, transanal excision is of uncertain benefit and the lesions may recur in almost half of the patients (34).

Colonic Varices

Colonic varices were reported as a source of bleeding in 0.07% of cases in an adult-autopsy series (31). In almost all cases, GI bleeding is intermittent, but in most cases it is massive (35,36). The most common location is the rectosigmoid area (31). The most common cause of colonic varices is portal hypertension due to liver disease in most cases, and portal vein obstruction in the remainder (35). However, numerous other causes of colonic varices have been described, including congestive heart failure with chronic passive congestion, mesenteric vein thrombosis, postoperative intra-abdominal adhesions, and chronic pancreatitis with splenic vein thrombosis (37). Colonoscopy and angiography are the primary diagnostic tools for detecting colonic varices. They can be visualized by visceral angiography with a sensitivity of 95%; however, bleeding from varices is rarely demonstrated, because of the dilution of the contrast medium in the venous phase (35,38). In colonoscopy, colonic varices appear as serpiginous bluish collapsible structures (31,35).

Portal Colopaty

Portal colopaty can occur in patients with portal hypertension and those associated ectasia-like lesions in the colon may be associated with acute LGI bleeding (31). Kozarek et al. (39) recently reported a series including 10 cases, 70% of those having mucosal abnormalities resembling multiple vascular ectasias.

Small Bowel Diverticula

Although diverticular disease is rarely seen in the small intestine, it has been reported as a source of massive LGI bleeding in more than 50 cases (31). It is first described in 1794 and the cause is unknown (31). Jejunal diverticulosis is considered as an acquired abnormality of the small bowel, the diagnosis of which is difficult because neither the symptoms nor the physical

findings are specific (40). Patients present most often with massive acute rectal bleeding (41). When it is identified preoperatively as the source of LGI bleeding, segmentary jejunal resection is the treatment of choice (41).

Meckel's Diverticulum

Meckel's diverticulum, located within 100 cm of the ileocecal valve on the antimesenteric border, is the most common congenital anomaly of the gastrointestinal tract. It occurs in 2% of the normal population and remains mostly asymptomatic throughout life. Gastrointestinal bleeding is the most common complication in the symptomatic cases (31). Bleeding due to Meckel's diverticulum usually occurs in childhood; however, it may be present in adults. Meckel's diverticulum contains heterotopic gastric and pancreatic mucosa so that it can produce acid and pancreatic exocrine enzymes. Acid can cause ulceration within the diverticulum and pancreatic enzymes can also contribute to ulceration and bleeding. Intussusception due to invagination of the diverticulum is accepted as another mechanism for bleeding in patients who do not have any heterotopic gastric or pancreatic mucosa. (42). The preoperative diagnosis of Meckel's diverticulum may be difficult; however, in patients with massive LGI bleeding, the lesion can be identified with a focal extravasation of intravenous contrast by angiography. Scintigraphy using 99mTc pertechnetate, which accumulates in the gastric mucosa, may show the image of Meckel's diverticulum. When the diagnosis is established, a segmentary ileal resection containing the diverticulum should be performed.

Dieulafoy Lesion of the Colon and Small Intestine

Dieulafoy lesion in the stomach is well described as a cause of massive upper GI bleeding. Recently, even though very rarely, Dieulafoy lesion of the colon has been described (43-45). Barbier et al. (43), Ma et al. (44), and Richards et al. (45) reported five cases in total with massive bleeding from a submucosal artery. Angiography is a helpful diagnostic tool in such cases. Colonoscopy cannot identify the lesion because of massive bleeding (31). On the other hand, Dieulafoy-like lesions causing acute LGI bleeding in the small bowel have also been reported (46). The pathogenesis of the lesion remains unknown. When the differential diagnosis is made by angiography, surgical resection of the affected segment is the treatment of choice.

Colitis

Lower gastrointestinal bleeding can be due to inflammatory bowel disease, infectious colitis, or ischemic colitis (10). If severe colitis is encountered during urgent colonoscopy for hematochezia, the risk for perforation should be remembered and the endoscopic procedure should be ended following the biopsy of the inflammatory area. Acute major hemorrhage is uncommon in inflammatory bowel disease (1-5%), accounting for 0% to 6% of all hospitalizations for Crohn's disease and 1.4% to 4.2% for ulcerative colitis (47-49). However, most cases are due to Crohn's disease, without a predilection for site of involvement. The presence of an endoscopically treatable lesion is uncommon, and surgery is required in less than half of the cases during the initial hospitalization. Recurrent hemorrhage is not rare, and for these cases surgery may be the most appropriate treatment. Pardi et al. (47) have given this recurrent bleeding rate as much as 57%. For patients with ulcerative colitis, the progressive severity of bleeding may be an important indication for surgery (colectomy); in Crohn's disease, patients with ileocolic location of the disease are more likely to have severe hemorrhage, and may require resection as a result (49).

Colorectal Tumors

Colorectal tumors very rarely cause massive LGI bleeding. If any focal bleeding site is present, endoscopic treatment may be given. Surgical resection is the radical modality in patients with uncontrollable bleeding.

DIAGNOSIS

The LGI bleeding is often intermittent. The identification of the source is usually difficult, sometimes even impossible, if the bleeding is not active.

Colonoscopy

Colonoscopy is the first step of the diagnostic assessment in patients with acute LGI bleeding. Anoscopy and sigmoidoscopy can be performed as initial examinations, if colonoscopy is not

available. The examination via sigmoidoscopy of the anal canal, rectum, sigmoid colon, and descending colon for mucosal abnormalities and mass lesions with sigmoidoscopy may confirm a distal colonic source. The timing of colonoscopy within 6-12 hours of admission requires an out of hours endoscopy service, which in our country is not universally available. It requires the presence of a trained endoscopist for accurate diagnosis and effective intervention plus a well-qualified assistant and other facilities.

In patients with a large volume LGI bleeding that stops, the colon can be prepared before colonoscopy. In patients with active bleeding, however, visualization is difficult and the risk of perforation may be increased (3). It is conceivable that a large volume purge may exacerbate LGI bleeding in some patients (50,51). Potential problems in voluminous bowel preparation include clinically significant fluid retention, which occurred in 4% of the patients (16).

It was formerly thought that urgent colonoscopy for severe hematochezia is dangerous, and often non-diagnostic and impractical. Recent progress, however, in the development of instruments and techniques has overcome the limitations of urgent colonoscopy. The procedure is also feasible with adequate prior colonic cleaning. Ohyama et al. (52) retrospectively analyzed 345 patients who underwent urgent colonoscopy for acute LGI bleeding within 24 hours after a bleeding episode and found the overall diagnostic accuracy for bleeding site detection as 89.1%. Endoscopic hemostasis was performed in 48 cases with 66.7% (32 cases) permanent hemostasis success. It was concluded that urgent colonoscopy for massive LGI bleeding was a safe and useful procedure. Jensen et al. (15) prospectively studied the role of urgent colonoscopy in the diagnosis and treatment of 121 patients with severe hematochezia and diverticulosis. A sulphate purge was applied to the patients to clean the bowel and colonoscopy was performed within 6-12 hours after hospitalization. Definite signs of diverticular hemorrhage were identified in 27 (22%) patients. In the first 73 patients, the policy for actively bleeding diverticulosis was to perform hemicolectomy. In the last 48 patients, however, this was changed to endoscopic treatment in similar circumstances. It was performed in 10 actively bleeding cases with a 100% success rate for complete hemostasis without any recurrence. Chaudhry et al. (53) performed a total of 126 urgent unprepared colonoscopies in 85 patients with LGI bleeding and correctly identified the source of bleeding in 97% of the patients. Of these sources 91% were colonic and 9% were in the small bowel. It was concluded that diagnostic and therapeutic capability with colonoscopic intervention to control active hemorrhage is especially appealing. They also believe that the pattern, amount, and location of blood in the unprepared colon all give clues as to source and type of bleeding. Machicado and Jensen (54) evaluated 100 patients with acute LGI bleeding by urgent colonoscopy and found a definitive colonic lesion in 74% of cases. Angiodysplasia accounted for 30% of total or 41% of all colonic bleeding sites in their series. Urgent colonoscopy was proved cost-effective rather than medical, angiographic, and surgical management of the patients with severe ongoing hematochezia.

The small intestine is a potential origin of hemorrhage in patients with unexplained LGI bleeding. Belaiche et al. (55) performed lower tract video push enteroscopy for diagnosis of small intestine disorders causing possible hemorrhage in 54 patients and found little help. It was concluded that performing a second colonoscopy was more appropriate.

Martinez et al. (56) performed intraoperative endoscopy (IOE) in 58 patients with several colorectal disorders such as colorectal cancer, diverticulitis, IBD, or LGI bleeding. They found that in 10% of cases IOE changed the extent of the surgical procedure without any additional complication rate related to IOE. IOE may be used in patients with acute LGI bleeding undergoing emergency surgery without exact preoperative diagnosis for both differential diagnosis and determining the adequate border of surgical resection.

High accuracy, safety, and therapeutic capability make colonoscopy the initial diagnostic test of choice for acute LGI bleeding.

Radionuclide Scanning

Technetium sulfur colloid scintigraphy and Technetium-labelled red blood cells (TRBC) scintigraphy are the two radionuclide techniques

used for localization of source causing LGI bleeding (3). The former technique, which uses a radiopharmaceutical that is rapidly cleaned from the intravascular space by the reticuloendothelial system (RES), can show an extravasation into the lumen when the bleeding rate is over 0.5 mL/min (3). It is removed from the circulation in 5 to 10 minutes so that this technique requires the patients be actively bleeding during the few minutes the agent is in the blood (57,58). The patient must be actively bleeding during this time in order for the bleeding to be detected, and bleeding sites, which overlap with the liver or spleen, can be obscured. The latter technique, where autologous red blood cells are labelled in vitro with technetium and injected into the patient, offers a clear advantage over the sulfur colloid scan with its longer intravascular duration. Abdominal image can be obtained at 5-minute intervals for the first 30 minutes and every few hours for up to 24 hours (58). Tagged-erythrocyte scintigraphy has been reported to detect bleeding rates as low as 0.05 to 0.01 mL/min (59).

Nicholson et al. (57) studied 41 patients with acute LGI bleeding and identified a definitive bleeding site in 30 (73%) patients by either colonoscopy, arteriography, or laparotomy. In 29 of the 30 patients (sensitivity 97%), TRBC scintigraphy could localize the bleeding site with the 83% specificity rate and 94% positive predictive value. Contrarily, Hunter and Pezim (60) give the sensitivity rate of TRBC scanning as 26% for localizing the bleeding site in 203 patients with LGI bleeding.

TRBC scintigraphy can only localize the bleeding to an area of the abdomen. Although this seems a disadvantage, it can be used to determine which patients are bleeding sufficiently to undergo angiography and it also allows for more selective angiographic studies in such cases. Rantis et al. (58) gave the sensitivity and specificity of TRBC scintigraphy in detecting LGI bleeding as 84.6% and 70.4%, respectively. They conclude that a negative scan is highly predictive so that a patient will not need therapeutic intervention for bleeding during hospitalization.

If the bleeding is profuse, there is no need for a screening examination and one should proceed directly to angiography or surgery. If, however, the bleeding is moderate or intermittent, a positive TRBC scintigraphy may be used to predict the likelihood of a positive angiogram demonstrating the site of bleeding while a negative scan may avoid potential morbidity in patients who might not benefit from an angiogram.

Angiography

Selective angiography is a sensitive diagnostic method for evaluating major LGI bleeding. If the arterial bleeding rate is higher than 0.5 mL/min, extravasation of contrast material may be seen (3). Angiography does not require bowel preparation and gives precise anatomic localization. Moreover, infusion of vasopressin and transcatheter embolization can be issued with this technique. Its disadvantages include a requirement of active bleeding and a relatively high complication rate (9%) (61). The most common complications related to angiography are arterial thrombosis, embolization, and renal failure (16).

TREATMENT

The main approach to definitive therapy is colonoscopic, angiographic, or surgical. Acute LGI episodes stop spontaneously in almost 80% of cases so that most patients require elective therapy. However, if the active bleeding site is identified by colonoscopy or angiography, endoscopic hemostasis or angiographic embolization should be performed. Urgent therapy should be initiated in patients with recurrent or ongoing bleeding who have required more than 3 units of blood (3,21). If the patient requires more than 6 units of blood to replace the blood loss and maintains the cardiovascular instability, surgical therapy should be considered (4).

Endoscopic Treatment

Endoscopic therapy includes the use of sclerotherapy, thermal heater probes, electrocoagulation (monopolar cautery, bipolar circumactive probe, argon beam coagulator), and laser (neodymium-YAG) (1). Electrocoagulation can be successfully applied for bleeding colonic diverticula; however, the risk of perforation is higher with this method (62). On the other hand, efforts at endoscopic control of diverticular hemorrhage may precipitate more significant

bleeding (1). The heater probe is preferred for bleeding diverticula. In contrast, angiodysplasias are readily treated with endoscopic measures. Acute hemorrhage can be controlled in up to 80% of cases with bleeding angiodysplasias, although rebleeding may develop in up to 15%. Approaching the lesion from the perimeter, obliterating feeder vessels before cauterization of the central vessel, may avoid precipitating massive hemorrhage. The most common complications of endoscopic treatment include rebleeding and perforation (3). Postpolypectomy bleeding, which develops in 1% to 2% of patients after polypectomy during the following 2 weeks, may easily be managed with endoscopic approach. Electrocauterization by hot biopsy forceps or re-snaring the remnant pedicle are appropriate methods for controlling the bleeding.

Angiographic Treatment

Angiographic injections of vasopressin and embolization are used for the treatment of bleeding angiodysplasia and diverticula. In patients whose bleeding source is identified by angiography, a trial of angiographic therapy may be appropriate as a perioperative temporizing measure or as a definitive measure for high-risk surgical candidates (1). Intra-arterial vasopressin is effective in 80-90% of cases; however, 50% of patients rebleed and complications can occur in 5% to 15% (1,21). Complications include myocardial ischemia, pulmonary edema, mesenteric thrombosis, and hyponatremia (1). Transarterial vasopressin is used to achieve temporary control of bleeding before emergency definitive surgical resection.

Selective arterial embolization is a relatively safe and successful procedure in patients with massive LGI bleeding. It is recommended for patients who failed intra-arterial vasopressin and are poor candidates for surgical resection. Luchtefeld et al. (63) reported 82% success rate of transcatheter arterial embolizaton in stopping bleeding in patients with LGI bleeding. Ledermann et al. (64) performed superselective microcoil embolization in 7 patients with massive LGI bleeding and stopped the bleeding successfully. Embolization materials which they used in their series were microcoils (2-4 mm), microcoils and polyvinyl alcohol particles (355-500 (μm), and microcoils and gelatine sponge particles. Gordon et al. (65) performed transcatheter embolization in 17 patients with angiographically demonstrated small intestinal or colonic bleeding. Bleeding was stopped in 13 of 14 patients (93%) in whom embolization was possible, and in 13 of 17 patients (76%) where there was an intention to treat. They did not observe any clinically apparent bowel infarctions due to embolization. However, Cohn et al. (66) controversially reported a lower success rate with angiography for identification of bleeding sites in patients with LGI bleeding. In their series, 65 patients underwent 75 selective angiograms; only 23 patients (35%) positive angiography findings and 14 of them (61%) required operations. Forty-two patients (65%) had negative angiography findings and 8 of them (19%) required operations. Complications from angiography occurred in 7 patients (11%) in this series. The authors conclude that selective angiography appears to add little clinically useful information in patients with acute LGI bleeding and carries a relatively high complication risk.

Selective embolization can achieve temporary control of bleeding from angiodysplasias and diverticula. This procedure may cause a colonic infarction presented by severe abdominal pain and fever with the lack of collateral blood supply to the colonic wall. Therefore, embolization should be restricted to patients who cannot tolerate surgery or as a temporizing measure in massive bleeding in patients for whom a definitive surgical resection is imminent.

Surgical Treatment

Blind and emergency segmental colectomy without adequate localization of the bleeding site in the surgical treatment of severe LGI bleeding carries 30% to 40% mortality rate and 33% of rebleeding rate (67). This surgical therapy was widely used until the1970s, since then the adoption of subtotal colectomy has reduced operative mortality to 20% (67). However, it carries significantly higher perioperative morbidity. Moreover, diarrhea and rapid transit after total abdominal colectomy can also be debilitating conditions, especially for elderly patients (1). Nevertheless, recent advancements on endoscopic and angiographic techniques for the definite localization of bleeding site in the preoperative period of patients with LGI bleeding again made segmental resections the surgical treatment of choice.

Surgical therapy should be preferred in the treatment of patients who have lost a large-volume of blood (i.e. transfusion of greater than 6 units of packed red blood cells, ongoing transfusion requirement, persistent hemodynamic instability) or who have recurrent bleeding and have failed to respond to endoscopic and angiographic therapy. It is also considered for patients with angiodysplasia that are not controlled with endoscopic hemostatic attempts or those with numerous angiodysplasias making these techniques unfeasible (4,68).

Farner et al. (69) retrospectively analyzed 77 patients with acute LGI bleeding who required surgical therapy. Fifty of these cases underwent limited colon resection (LCR) and total or subtotal colectomy was performed in the remaining 27 cases. They found significantly more common recurrent bleeding in the LCR group (18% versus 4%) with similar morbidity and mortality rates and concluded that total or subtotal colectomy should be considered more often in the management of these patients. Parkes et al. (70) give the re-bleeding rate as 0% following subtotal colectomy whereas 14% after segmental resection with positive angiography and as high as 42% with negative angiography.

Field et al (71) recommend total abdominal colectomy for control of massive LGI bleeding with the rational that hemodynamic instability sometimes does not allow extensive preoperative evaluation and the diagnostic procedures are not always available. Furthermore, in the case of more than one site being visualized as bleeding, or in the presence of widespread diverticulosis in a good-risk patient, wide resection should be necessary. However, Setya et al. (72) reported a very high mortality rate (33%) and morbidity occurrence (75%) following subtotal colectomy for the 12 cases with massive, unrelenting LGI bleeding similar to the results of Bender and co-workers' (73). In the latter series with 49 total abdominal colectomies, the overall mortality was 27% but the authors stressed that if the blood loss was so extensive as to need 10 or more units of blood transfusion, the mortality rate parallel increased (45% versus 7%).

Every effort should be made to localize the source of bleeding so that a hemicolectomy can be performed rather than a blind subtotal abdominal colectomy. When the bleeding site is localized, segmental resection is done. Because angiodysplastic and diverticular bleeds are located in the right side, the right hemicolectomy is the most commonly performed segmental operation. In case of patient rebleeds where the bleeding site cannot be localized, a subtotal colectomy may be performed. The overall mortality rate of surgery for acute LGI bleeding is less than 5% (1,3,21). Bleeding is not the cause of death; rather, pneumonia, cardiovascular events, and renal failure lead to poor outcomes, primarily in elderly patients with recurrent hemorrhage (1). Thorough timing of surgical management in LGI bleeding increases the success rate.

In conclusion, acute lower gastrointestinal bleeding, still a difficult clinical challenge, may originate from any level of the gastrointestinal tract. If the bleeding is not ongoing, the identification of the source may be difficult or impossible, even with the combination of available current diagnostic tools such as scintigraphy, endoscopy, and angiography (Fig 1). The latter two measures confer therapeutic

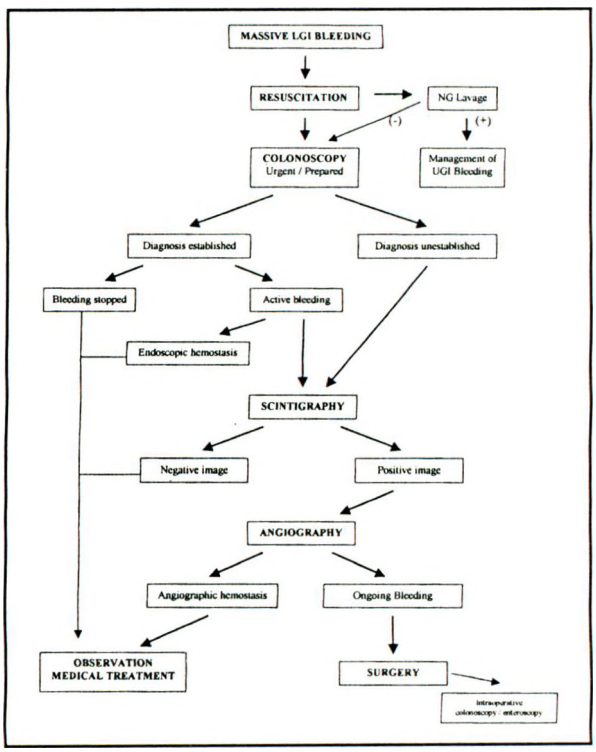

Fig.1 : Algorithm of approach to acute lower gastrointestinal bleeding.

advantages, especially for diverticular disease and angiodysplasias, which are the most common causes of acute LGI bleeding. When the bleeding is active and the source is localized, conservative hemostatic studies such as endoscopic hemostasis and angiographic vasopressin injections or transcatheter embolization can be issued, especially in patients who are poor candidates for surgery. Furthermore, the identification of the bleeding source allows segmentary resection so that the morbidity and mortality rates can be decreased. However, a blind emergency subtotal abdominal colectomy can be necessary in some patients who suffer massive bleeding where the diagnostic tests have failed to achieve any source of hemorrhage. One of the major problems for clinicians in the management of LGI bleeding that may recur following all types of therapeutic interventions and sometimes necessitate is wide colonic resection even in patients who have already undergone some sort of surgical therapy.

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