Highlighted Steps of the Management Algorithm in Acute Lower Gastrointestinal Bleeding - Case Reports and Literature Review

Gabriel Nicolae Andrei[1], Bogdan Popa[2], Laurentiu Gulie[2], Bogdan Ionut Diaconescu[1,3], Bogdan Valeriu Martian[1], Mircea Bejenaru[1], Mircea Beuran[1,3]

[1]Department of Surgery, Clinical Emergency Hospital Bucharest, Bucharest, Romania
[2]Department of Interventional Radiology, Clinical Emergency Hospital Bucharest, Romania
[3]University of Medicine and Pharmacy "Carol Davila", Bucharest, Romania

Rezumat

Etape importante ale algoritmului de management în hemoragiile gastrointestinale inferioare acute - raportare de cazuri și recenzie a literaturii

Hemoragiile gastrointestinale inferioare reprezintă o problemă majoră în întreaga lume, fiind o afecțiune relativ rară cu o rată a mortalitații situată între 2 și 4%. Reprezintă 1 – 2% din totalul urgențelor intraspitalicești, 15% din ele fiind hemoragii masive și până la 5% necesitând intervenții chirurgicale. Pot fi clasificate în funcție de localizare în hemoragii ale intestinului subțire sau ale colonului. Hemoragiile de la nivelul intestinului subțire sunt cele mai rare (5%). Atunci când terapia endoscopică asociată cu cea medicală sunt insuficiente, intervențiile endovasculare pot fi salvatoare de viață. Din păcate, în unele cazuri de hemoragie digestivă inferioară cu instabilitate hemodinamică și angiografie nonterapeutică, ultima resursă rămâne intervenția chirurgicală. În cele ce urmează exemplificăm două cazuri de hemoragie gastrointestinală inferioară acută care au fost rezolvate în modalitați diferite, descriem detaliat diferitele tipuri de tratament disponibile și în final, concluzionăm, sistematizâd cele mai importante etape ale algoritmului de management în hemoragiilor digestive inferioare acute.

Corresponding author: Gabriel Nicolae Andrei, MD, PhD student
                            Department of Surgery
                            Clinical Emergency Hospital Bucharest
                            No 8, Floreasca Street, District 1
                            014461, Bucharest, Romania
                            E-mail: gabi_and85@yahoo.com

Cuvinte cheie: hemoragii gastrointestinale inferioare acute, etape importante, algoritm de management

Abstract

Acute lower gastrointestinal bleeding is a major problem worldwide, being a rare and life threatening condition, with a mortality rate situated between 2 and 4%. Acute lower gastrointestinal bleeding is solvent for 1 - 2% of the entire hospital emergencies, 15% presenting as massive bleeding and up to 5% requiring surgery. Lower gastrointestinal bleeding can be classified depending on their location in the small or large intestine. The small bowel is the rarest site of lower gastrointestinal bleeding, at the same time being the commonest cause of obscure bleeding. 5% of total lower GI bleeding appears in the small bowel. When endoscopic therapy associated with medical treatment are insufficient, endovascular intervention can be lifesaving. Unfortunately in some rare cases of acute lower gastrointestinal bleeding with hemo-dynamic instability and the angiography performed being unable to locate the source of bleeding, the last therapeutic resource remains surgery. In the following we exemplify two cases of acute lower gastrointestinal bleeding which were resolved in different ways, followed by a thorough description of the different types of available treatment and finally, in the conclusions, we systematize the most important stages of the management algorithm in acute lower gastrointestinal bleeding.

Key words: acute lower gastrointestinal bleeding, highlighted steps, management algorithm

Case Report 1

An 18 - year old man was admitted to the department of the General Surgery of the Emergency Hospital Floreasca after several episodes of hematochezia. The patient has no medical history and the current suffering dates 2 days before, with the appearance of blood in stool, subsequently with progressive evolution. At admission the abdomen is supple, mobile with respiratory movements, painless spontaneous or on palpation, with no signs of peritoneal irritation. The digital rectal examination revealed fresh blood. The general clinical examination revealed an afebrile patient, with a bmi of 21.3 kg/m², with skin and mucous membranes pale, dehydrated, hemodynamic stable with a blood pressure of 135/75 mmHg and the heart rate of 93 beats per minute. We performed laboratory tests that showed microcytic hypochromic posthaemorrhagic anemia with a hemoglobin of 9.3 g/dL. The remaining blood tests were normal. Preliminary laboratory investigations, chest X-ray, abdominal X-ray in standing position and abdominal ultrasound, didn't show any particular distress. We initiated electrolyte and acid-base rebalancing and blood products administration in parallel to the mechanical bowel preparation using four liters of Fortrans. The next day after admission we performed the colonoscopy and upper gastrointestinal endoscopy. Both investigations revealed no injuries. The patient continued the episodes of hematochezia and we therefore considered appropriate to perform angiography with selective injection of superior (Fig. 1, Fig. 4) and inferior (Fig. 2, Fig. 3) mesenteric artery, without active bleeding visible.

Subsequently, after another episode of massive bleeding with the advent of the hemodynamic instability we decided to turn to surgery. Intraoperatively, we found Meckel diverticulum with active vascular fistula. We performed enterectomy with entero-enterostomy. The postoperative course was uneventful, the patient being discharged in the 4th postoperative day.

Case report 2

A 47 - year old man known with type 2 diabetes was admitted to the department of General Surgery of the Emergency Hospital Floreasca with massive lower gastrointestinal bleeding, the episodes of hematochezia started 36 hours before presentation to hospital. At admission after preliminary laboratory investigations the patient has an acute posthaemorrhagic anemia (hemoglobin – 7.5g/dL). In the emergency department we decided to perform an upper gastrointestinal endoscopy which revealed no particular distress. After this first intervention we performed a rigid colonoscopy which didn't uncover the bleeding source but highlighted fresh blood and blood clots in large quantity located in the rectum and sigmoid. We considered appropriate to perform angiography, with selective injection of superior and inferior mesenteric artery, which revealed active bleeding at the leveal of the terminal ileum. Super - selective catheterization was performed using microcatheter 2.8 Fr and the embolization was carried out using two fibrin sponges (Fig. 5).

The outcome was favorable and the bleeding stopped. The diagnosis was of terminal ileum angiodysplazia. Subsequently we initiated conservative treatment : electrolyte and acid-base rebalancing and blood products administration with favorable evolution and reissue of the symptoms. A complete CT scan was performed after this episode which did not reveal anything else. The patient was discharged 10 days later.
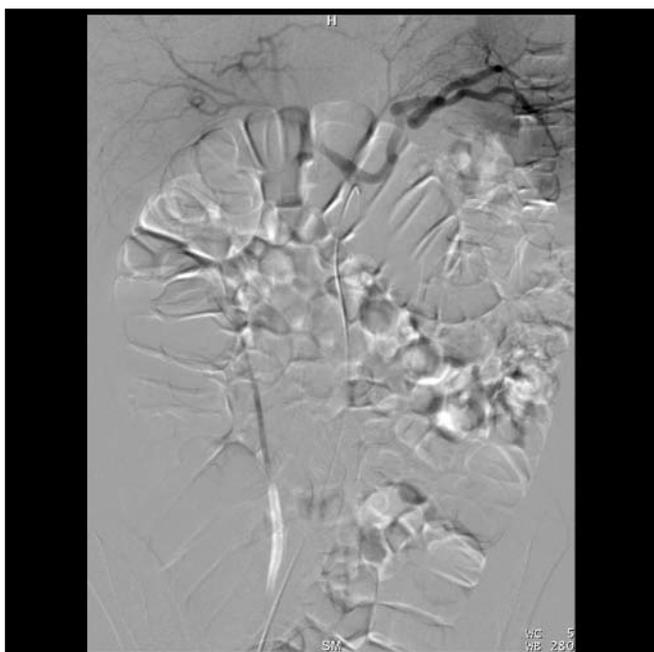

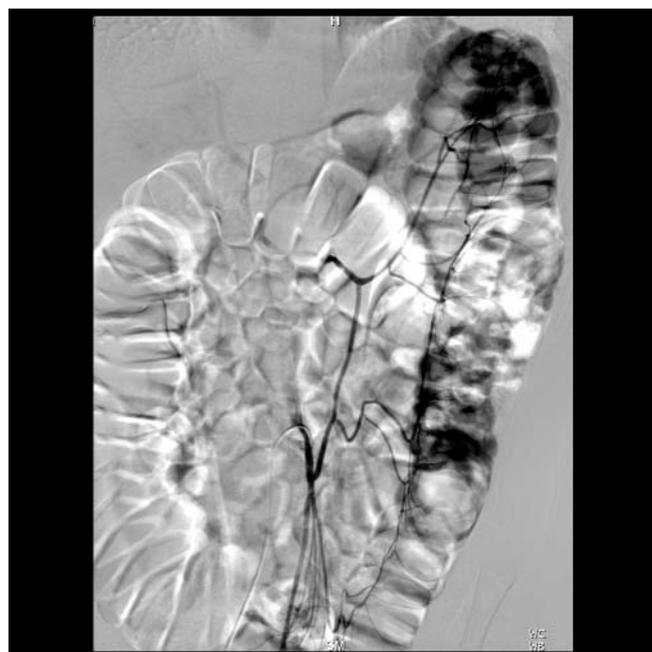**Figure 1.** *Selective injection of superior mesenteric artery*

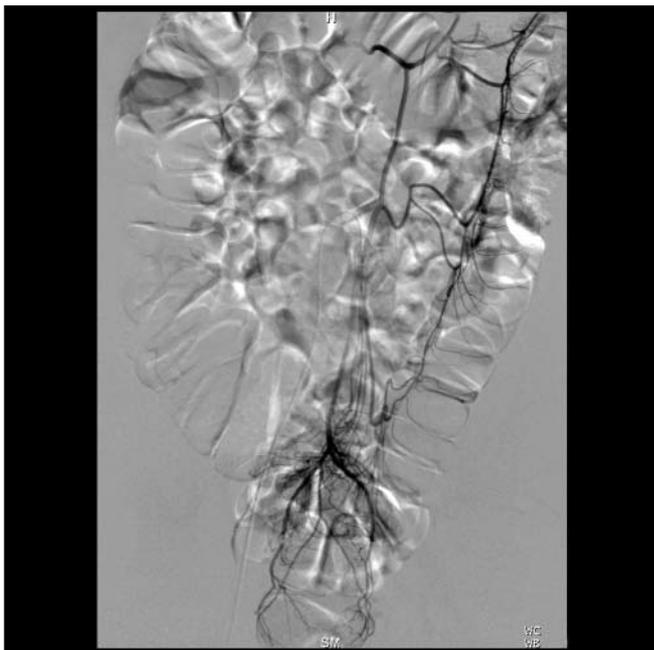**Figure 2.** *Selective injection of inferior mesenteric artery*

Figure 3. Selective injection of inferior mesenteric artery

Figure 4. Selective injection of superior mesenteric artery

Figure 5. Super - selective catheterization of superior mesenteric artery

Discussion

Acute lower gastrointestinal bleeding is a major problem worldwide that requires evaluation and management. The annual incidence is estimated at 0.02 – 0.03% in developed countries (1), and it is believed to be solvent for 1 -2% of the entire hospital emergencies, 15% presenting as massive bleeding and up to 5% requiring surgery. The mortality rate is situated between 2 to 4% (2). Lower gastrointestinal bleeding refers to bleeding that originates distal to the ligament of Treitz. Acute lower GI hemorrhage typically produces changes in the hemodynamic status: instability of vital signs / anemia / need for blood transfusion (3 - 5 units of blood transfused/24 h). 5% of total lower GI bleeding appears in the small bowel (3). Bleeding may be present as melena or as hematochezia. Even if there is no standard way for the management of acute lower gastrointestinal bleeding, the diagnostic armamentarium involves endoscopy, radionuclide scintigraphy, mesenteric angiography and surgery. Physical examination most often doesn't predict clinical outcome and diagnostic studies are invasive procedures. Acute lower gastrointestinal bleeding can appear at any age, but some diseases are specific for different groups of age. Young people most commonly bleed from a Meckel's diverticulum, inflammatory bowel disease or polyps (4). The incidence of Meckel diverticulum is in the range of 1 - 3% (5). Bleeding most commonly results from the ulceration of the ectopic gastric mucosa in the diverticulum. About 20% of patients with Meckel diverticulum are symptomatic - most commonly bleeding (6). Older patients have higher risk of bleeding from diverticulum hemorrhage, neoplasm or arterio-venous malformations. Arterio-venous malformations can be found anywhere, but are usually located in the right colon. They develop because of the high pressure in the colonic wall,
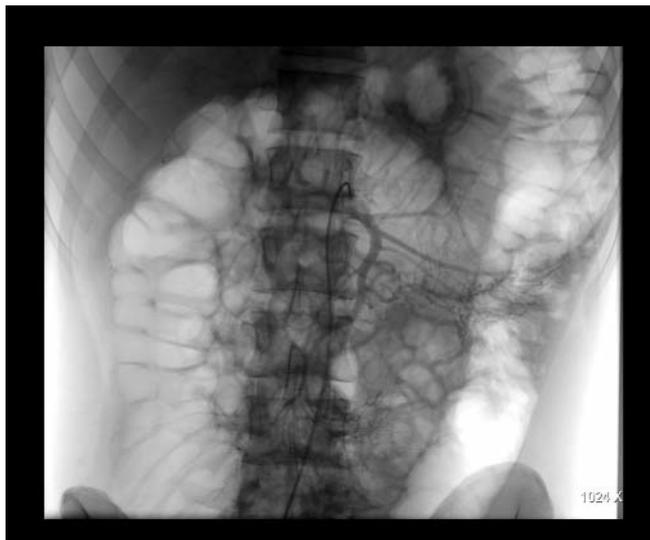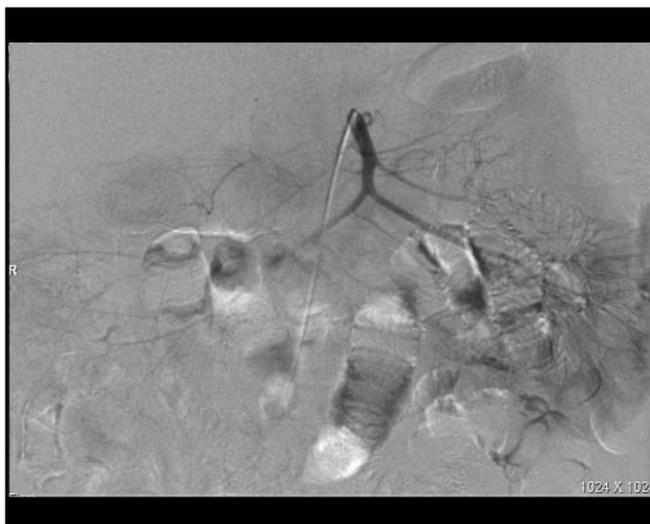
which will determine chronic venous congestion, capillary dilation and ectatic vessels (7). Arterio-venous malformations are the most common cause of small bowel bleeding in a study by Liao et al. that included 22 840 patients: 66%. (8). In terms of strict small bowel bleeding sources, in a study published by Zhang et al., 385 small bowel bleeding patients were analyzed: older patients (> 65 years): vascular anomalies (54.35%), small intestinal ulcer (13.04%), small intestinal tumours (11.96%), in middle age: vascular anomalies (34.82%), small intestinal tumours (31.25%) and in young adults (< 40 years): Crohn's disease (34.55%), small intestinal tumours (23.64%) and non-specific enteritis (10.91%) (9). Rare causes of acute lower GI bleeding may be: postpolypectomy bleeding (10), infectious colitis, small bowel tumors, solitary rectal ulcer, post-anasto-motic bleeding, aorto-enteric fistula (11), colonic or rectal stomal varices, intestinal intussusception (12), radiation colitis or nonsteroidal antiinflammatory drug.

Resuscitation and stabilization

Patients with acute lower gastrointestinal bleeding can have : fatigue, pallor, postural hypotension, cardiac palpitations or tachypnea. Initial management means the placement of large catheters, hemodynamic monitoring, placement of a urinary catheter and a nasogastric tube - checking for the presence of upper GI bleeding (13). We have to know that 11 - 15% of patients can have an upper source of bleeding despite "negative" NGT aspirate. In this condition some authors recommend EGD in all patients with hematochezia (14). The purpose of this resuscitation is to restore volume and to maintain oxygen delivery. Coagulopathies have to be redressed. Indicated laboratory studies include: complete blood count, coagulation profile and serum electrolytes. The diagnostic evaluation starts with a digital anorectal exam. A rigid recto - sigmoidoscopy allows to evacuate blood and clots and to exclude internal hemorrhoids, neoplasms or colitis. Depending on the severity of the bleeding and patient's age an ICU admission might be taken into account. A complete history of the patient's medications (NSAIDs, anticoagulants) and past medical history should be carried out. Afterwards in order to make the diagnostic, we can proceed with three options: colonoscopy, angiography and nuclear scintigraphy. The first two can offer therapeutic intervention while the last one is purely diagnostic. Patients with acute lower gastrointestinal bleeding can be divided into two clinical categories: major self-limited and major ongoing. The last one usually requires angiography or surgery. The major self-limited bleeding creates controversy. Patients falling here should have a diagnostic test to determine if they require prompt therapy or observation.

Nuclear scintigraphy

It detects lowest bleeding rates : 0.1 to 0.5 mL/min. Nuclear scintigraphy is considered to be more sensitive than angiography in detecting bleeding but cannot indeed localize the site of hemorrhage (15). Imbembo et al. in his article consider that this technique fits best for patients with major self-limited bleeding (16). Hammond et al suggests in his study that if the scan shows an immediately positive blush (first 2 minutes), then it predicts a positive angiogram in 60% of cases and in 24% the surgical opportunity of the case. If the initial scan does not show a blush, then it predicts a negative angiogram in 93% of cases and the potential need for surgery drops down to 7% (17). In conclusion, we can say that a negative nuclear scintigraphy study shows that a patient is not actively bleeding anymore, therefore preparation for colonoscopy may proceed.

Colonoscopy

Bounds et al and many other authors consider that colonoscopy promotes the highest sensitivity in patients presenting with acute lower gastrointestinal bleeding that appears to be self-limited (18). The colonoscopy has an important advantage over other options in the management of lower gastrointestinal bleeding : it can diagnose and even treat in the absence of ongoing bleeding. However in cases of hemodynamic instability with ongoing bleeding, it is difficult to safely prepare the large bowel with limited intraluminal vizualization of the lesion and inability for therapeutic resources, that's why in this cases angiography or surgery are indicated. Mechanical bowel preparation is under debate. Colonoscopy performed without preparation is called emergent colonoscopy. Performing colonoscopy within 24 hours of presentation after mechanical bowel preparation using lavage method is called urgent colonoscopy. Emergency colonoscopy has a diagnostic accuracy reported to be between of 72% to 86% (19). The advantage of the colonoscopy is the fact that it can provide the localization of ongoing bleeding and that it has the potential for therapy. The endoscopist can mark the region of colon with a tattoo, providing the surgeon the localization of the bleeding source in case of failed medical management. Colonoscopy has some therapeutic options: bipolar coagulation, laser therapy, using topical or intramucosal injection of epinephrine, application of clips (23).

Some authors have compared colonoscopy to radiographic interventions in the management of lower gastrointestinal bleeding. Jensen et al compared in his study 17 patients with lower intestinal sources of haemorrhage. The diagnostic was put by colonoscopy in 82% of the patients, and angiography in 12% of cases (29).

Colonoscopy in the management of lower gastrointestinal bleeding is considered to be a safe procedure. In a study by Strate et al comparing 664 patients, the complication rate was only 0.3% and 0.6% for those performed urgently (29).

Angiography

Angiography is a diagnostic and also a therapeutic tool in the management of acute gastrointestinal bleeding. In order to view the blush of contrast the bleeding rate has to be of at least 1 mL/min (21). This study sensitivity is situated between 40% and 78% (22). One possibility is the intra-arterial vasopressin infusion that can provide arterial contraction, carried forward to stopping of the hemorrhage. The side effects of vasopressin may limit its use. It can control bleeding up to 91% of cases, but bleeding may recur in 50% of cases. Another utility of the angiography is arterial embolization, selective or super selective, which may embolize vessels as small as 1 mm. Atherosclerotic disease and vasospasm can limit the utilization of the superselective embolization. However with the advance of the technology these no longer represent a challenge (30).

There are several variants of agents that can be used for embolization. Microcoils are the variant of choice, with a success rate of 81 - 100% (31). Compared with other variants of materials as Gelfoam or glue, microcoils are radio-opaque. The weak spot of micro-coil embolization is that it can endanger an eventual access to the targeted lesion, therefore in case of recurrent bleeding the only option remaining is surgery.

Rebleeding rates after micro-coil supraselective embolization are up to 40% (29).

Another potential agent is Gelfoam, that has the advantage of being temporary, allowing the recanalization of the embolized vessels (it appears usually in 2 - 6 weeks). Yet knowing the fact that bowel necrosis usually appears within 12 hours after the supra - selective embolization, this agent in the opinion of many authors has no added advantage.

The usage of glue is limited because of the fact that it can increase the risk of ischemia and nontarget embolization (32).

The angiographic embolization has a high rate of success in controlling diverticular bleeding (85-97%). Angiodysplazia is difficult to manage by embolization (high rate of reebleeing - up to 40%). However this has been remarked to appear more frequently in the cecum (33). When appropriate technique is used, the success rate is around 98%. Super selective angiographic embolization targets the vasa recta or the terminal artery distal from the marginal arch. Embolization - induced bowel ischemia is reported to be around 5% of cases (23). Arteriography can have complications: local (site of bleeding) and at distance (arterial emboli, renal toxicity, arterial thrombosis).

Computed Tomography Angiography

In recent years, CT scans performed without the usage of oral contrast can provide the localization of the gastrointestinal bleeding by visualization of the intraluminal extravasation of the intravenous contrast. Therefore the test can be performed only by using intravenous contrast, that's why it cannot be used in patients with renal insufficiency.

Huprich et al by using the CT scan with intravenous contrast found a sensitivity of 92 % in detecting the site of bleeding when there is active bleeding. When the bleeding is intermittent the sensitivity drops down to 45% (34).

Kuhle et al found in an animal model that Computed Tomography Angiography is more sensitive in detecting active bleeding than angiography, 0.3ml/min rates being required (32). Still it has a big disadvantage : inability to perform therapeutic procedures.

Other possibilities

If available, double-balloon enteroscopy is superior to single-balloon enteroscopy (24). Double-balloon enteroscopy and capsule endoscopy have about the same diagnostic range of 55 to 65% of patients with hematochezia (25). The capsule endoscopy has the disadvantage of possible failure to pass, that can occur in 5% of the time and necessitates further intervention for retrieval and also missed lesions that were subsequently identified on double-balloon enteroscopy (26). Double-balloon enteroscopy should only be attempted by a skilled, experienced endoscopist. If available, it has the added benefit of immediate therapeutic intervention.

Also upper gastrointestinal series and small bowel follow-through remain the most commonly used methods to examine the small bowel, but in elective manner. Likewise, conventional enteroclysis employing double contrast method showed better sensitivity for small intestinal disease to those mentioned above (28).

Surgical therapy

The vast majority of lower gastrointestinal bleeding can be treated by conservative or minimally invasive methods. In patients who remain hemodynamically instable after the initial resuscitation, those that become unstable in the conservative treatment trial or patients who fail the attempt of the initial minimally-invasive therapeutic options require surgery. It has been shown by Bender et al that the mortality increases with the rate of transfusion. The mortality rate for patients suffering from acute lower gastrointestinal bleeding needing less than ten units of blood is around 7% in comparison to those needing more than ten units (27%) (36).

Surgeons should adapt if possible the surgical approach to the preoperative diagnostic findings. After a midline incision, the surgeon should focused his attention in detecting intraluminal blood. After that the exploration begins in the upper GI tract (stomach and duodenum), and take into account possible missed bleeding sources. Next the entire small bowel is inspected searching for Meckel's diverticulum, ileitis or tumors. After this first exploration, we may consider also intestinal enteroscopy. The intestine access of the enteroscope may be : transoral, transgastric, transcolonic or transanal. Intraoperative endoscopy is a demanding technique. If the bleeding site is located, then a resection can be performed. If the bleeding seems to be from the colon, we can perform a subtotal / total colectomy. Hemodynamically stable patients can tolerate a primary anastomosis.

Conclusion

Our approach for managing acute lower gastrointestinal bleeding requires only the availability of regular gastrointestinal endoscopy lab, CT and angiography. Although there are more high-flown algorithms recently described in literature (37), in our opinion the most important steps in the management of acute lower gastrointestinal bleeding are:

1. Initial evaluation and resuscitation (nasogastric tube aspiration → no upper GI bleeding, rigid recto - sigmoidoscopy → exclude internal hemorrhoids, neoplasms or colitis).
2. The most important thing in the management of acute lower GI bleeding is practically the differential diagnosis of hematochezia. Colonoscopy is considered to be the main way for managing patients with minor-self limited and major self-limited acute lower GI bleeding in case of colonic bleeding.
3. In case of major ongoing bleeding the first option is angiography with a success rate of 98%, when appropriate technique is used.
4. In patients who remain hemodynamically instable after the initial resuscitation, those that become unstable in the conservative treatment trial or patients who fail the

attempt of the initial minimally-invasive therapeutic options require surgery.

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