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7

Management of lower gastrointestinal tract bleeding

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Acute bleeding from the colon and rectum is less frequent and less dramatic than haemorrhage from the upper gastrointestinal tract. In most cases, bleeding from the colon and rectum is self-limiting and requires no specific therapy. Diverticula and angiectasias are the most frequent sources of bleeding. Malignancy, colitis (inflammatory bowel disease, non-steroidal anti-inflammatory drugs, and infectious colitis), ischaemia, anorectal disorders, postpolypectomy bleeding, and HIV-related problems are less frequent causes. The recurrence rate, especially in diverticular bleeding, is high. Resuscitation and haemodynamic stabilisation of the patient is the first step in the management of colonic bleeding. Urgent colonoscopy is the method of choice for diagnosis and therapy. By analogy with peptic ulcer bleeding, risk stratification using stigmata of haemorrhage is gaining more importance. Modern endoscopic techniques such as injection therapy, thermocoagulation and mechanical devices seem to be effective in achieving haemostasis and avoiding precarious surgery. Angiography and nuclear scintigraphy are reserved for those patients in whom colonoscopy is not possible or has repeatedly failed to localise the bleeding site.

Key words: gastrointestinal haemorrhage; colon; rectum; haematochezia; diverticulum; angiodysplasia; colitis; neoplasms; colonoscopy; haemostasis; endoscopic therapy; electrocoagulation; laser coagulation; angiography; radionuclide imaging.

DEFINITIONS

Lower gastrointestinal bleeding is defined as acute or chronic blood loss from a source distal to the ligament of Treitz. *Acute lower gastrointestinal bleeding* is rather arbitrarily defined as a bleeding situation in which blood loss has been occurring for less than

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3 days and is causing haemodynamic instability, anaemia, or the need for a blood transfusion. Some 10–20% of all gastrointestinal bleedings occur from colonic and rectal sources.

CLINICAL PRESENTATION AND COURSE

The severity of lower intestinal bleeding comprises a spectrum from mild to moderate rectal bleeding to cases compromising the patient's haemodynamics. About one half of the patients will present with both anaemia and significant haemodynamic compromise, 9% with cardiovascular collapse, 10% with syncope, and 30% with orthostatic changes.^{1,2} Patients with lower gastrointestinal bleeding present with less haemodynamic instability than those with upper gastrointestinal bleeding. Patients with lower gastrointestinal bleeding show less frequent orthostasis (19% versus 35%), need less frequent blood transfusions (36% versus 64%), and present with higher haemoglobin levels.³ Spontaneous cessation of acute lower gastrointestinal bleeding occurs in about 80% of patients.⁴ The mortality rate among patients hospitalised with acute lower gastrointestinal haemorrhage is 2.4%; if bleeding occurs during hospital stay, the rate increases dramatically to 23.1%.⁵

A recent study⁶ on 252 patients with acute lower gastrointestinal bleeding found predictive factors which increase the likelihood of a severe course or recurrence of bleeding:

- heart rate ≥ 100 /min;
- systolic blood pressure ≤ 115 mmHg;
- syncope;
- non-tender abdominal examination;
- bleeding per rectum during the first 4 h of evaluation;
- history of acetylsalicylic acid use;
- more than two active comorbid conditions.

Velayos et al⁷ identified the following risk factors indicating severe lower gastrointestinal bleeding:

- haemodynamic instability (blood pressure < 100 mmHg, heart rate > 100 /min) 1 h after initial medical evaluation;
- active gross bleeding per rectum;
- initial haematocrit $\leq 35\%$.

INITIAL EVALUATION AND MANAGEMENT

History

The exploration of the patient and the direct observation of the bloody stool is the standard initial approach. Lower gastrointestinal bleeding is usually suspected when haematochezia is present. That means the passage of maroon or bright red blood or blood clots per rectum. This is different from upper gastrointestinal bleeding, which often includes haematemesis and melaena. However, massive upper gastrointestinal bleeding can also appear bright red; up to 11% of cases of haematochezia may have

upper gastrointestinal bleeding.⁸ As a rule though, passage of bright red blood per rectum resulting from upper gastrointestinal bleeding is associated with haemodynamic instability (shock or orthostatic hypotension). On the other hand melaena suggests upper gastrointestinal bleeding, although bleeding from the caecum may present in this manner.

There is also a strong association between intake of acetylsalicylic acid/non-steroidal anti-inflammatory drugs (NSAIDs) and lower gastrointestinal bleeding, particularly diverticular bleeding.⁹ A history of a preceding episode of hypovolaemic shock as well as known vascular disease should remind the physician of ischaemic colitis. A history of radiation therapy for prostatic or pelvic cancer will suggest bleeding from teleangiectasias in the rectum. In patients who have undergone colonoscopy in the days before admission, postpolypectomy bleeding is likely. Patients should be asked for any history of HIV infection, liver cirrhosis, inflammatory bowel diseases, teleangiectasias, coagulopathy (anticoagulants, von Willebrand's disease, haemophilia), colonic diverticulosis, or past bleeding episodes, and for symptoms suggestive of colorectal cancer such as family history, weight loss, and changes in bowel habits.

Physical examination

Physical examination should focus first on the patient's vital signs: e.g., pulse and blood pressure. A blood loss of <250 mL has no influence on heart rate or blood pressure. Loss of >800 mL results in a drop in blood pressure of 10 mmHg and a rise in heart rate of 10 beats/min. Extensive blood loss of >1500 mL results in marked tachycardia, shock, tachypnoea, and depressed mental status. Aspiration of gastric contents using a nasogastric tube has a high predictive value with regard to bleeding proximal to the ligament of Treitz, although in the negative case it cannot exclude this with total certainty. Careful digital rectal examination has to be performed in all patients presenting with lower gastrointestinal bleeding.

Laboratory tests

The initial laboratory work-up should contain:

- complete blood count (including haemoglobin, haematocrit, thrombocytes);
- coagulation profile;
- serum chemistry (electrolytes and creatinine);
- sample for type and cross-match.

Resuscitation

There are no clear recommendations about which patients should be admitted to an intensive care unit (ICU), but it seems reasonable to monitor closely all patients with ongoing bleeding or at high risk (identified by the above-mentioned factors). In addition, those patients with a transfusion requirement greater than two units of packed red blood cells, and those with a significant comorbidity, should be admitted to an ICU. Patients with congestive heart failure or valvular disease may benefit from close monitoring – central venous pressure, pulmonary catheter, PICCO (pulse-contour continuous cardiac output) – to minimise the risk of fluid overload.

Two large-calibre peripheral catheters or a central venous catheter should be inserted for intravenous access. The presence of coagulopathy – prothrombin time/international normalised ratio (INR) >1.5 – should be corrected using fresh frozen plasma or prothrombin complex concentrate and vitamin K. In patients with significant thrombocytopenia ($<50,000/\mu\text{L}$), platelet transfusions can be considered.

Rapid fluid replacement is indicated in patients with severe hypovolaemia or shock. In general, at least one to 2 L of isotonic saline are given as rapidly as possible in an attempt to restore tissue perfusion. Red blood cells should be used if there is ongoing haemorrhage or severe anaemia. The ideal haemoglobin concentration/haematocrit depends upon the patient's age, the rate of bleeding, and the presence of comorbid conditions. A young and otherwise healthy person can well tolerate a haemoglobin concentration of $<7\text{--}8$ g/dL (haematocrit $<20\text{--}25\%$), whereas older patients develop symptoms at this level. Maintaining the haemoglobin concentration around 10 g/dL (haematocrit: 30%) in high-risk patients (for instance an elderly patient with coronary heart disease) will be reasonable.

However, it must be emphasised that all these recommendations are given on an empirical basis.

DETERMINATION OF THE SOURCE OF BLEEDING

Practice guidelines for the evaluation of patients with presumed acute lower gastrointestinal bleeding have been published by the American College of Gastroenterology¹⁰ and the American Society for Gastrointestinal Endoscopy.¹¹ The triage and evaluation of patients with acute lower gastrointestinal haemorrhage remains variable, and depends also on the experience and the methods of investigation available in the specific institution and on the severity of bleeding. [Figure 1](#) shows an algorithm for the management of acute lower gastrointestinal bleeding.

Endoscopy

Endoscopy is considered the mainstay for evaluation of acute lower gastrointestinal bleeding. The incidence of serious complications is about 1 in 1000 procedures. Cardiopulmonary problems may account for more than 50% of complications associated with endoscopy; elderly patients and patients with cardiovascular or pulmonary diseases are at special risk. Aspiration (in upper endoscopy), over-sedation, hypoventilation, and vasovagal events are the major problems. Perforation rarely occurs, even in urgent colonoscopy. Patients should be continuously monitored during urgent endoscopy using electrocardiogram (ECG) and non-invasive measurement of oxygen saturation. In the case of unstable vital signs, patients must be resuscitated before endoscopy.

In patients with haematochezia and haemodynamic instability, *upper endoscopy* should be undertaken first to exclude an upper source of bleeding.⁸ Especially in patients with a history of peptic ulcer and portal hypertension, upper endoscopy should be considered early.

Although the historical view has been that urgent *colonoscopy* is impractical in patients with lower gastrointestinal bleeding, it is now well established that it is the diagnostic procedure of choice. As in upper gastrointestinal bleeding, there are three main ideas underlying urgent colonoscopy:

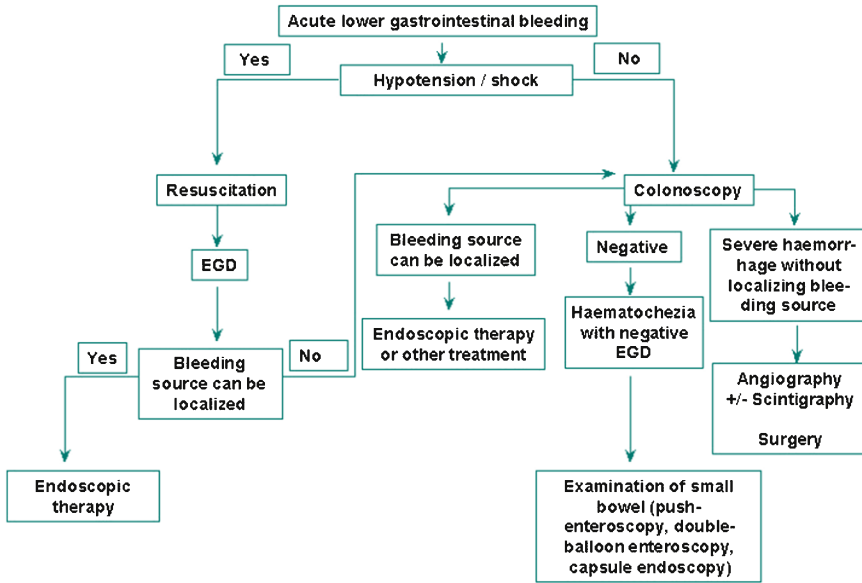


Figure 1. Algorithm for diagnosis and therapy of acute lower gastrointestinal bleeding.⁴⁵ EGD, oesophagogastroduodenoscopy.

- determination of the location and type of bleeding;
- identification of patients with ongoing haemorrhage or at high risk for rebleeding;
- potential for endoscopic intervention.

The diagnostic yield for urgent colonoscopy in acute lower gastrointestinal bleeding is reported in the literature as 48–90%.^{4,12} Two recent publications report diagnostic yields of 89–97%,^{13,14} which perhaps is a reflection of more consistent use of urgent colonoscopy. Two studies demonstrated that early colonoscopy is significantly associated with a shorter hospital stay.^{6,15} In most studies, early colonoscopy is defined as being done within 12–24 h after admission. On the other hand it was shown by a randomised trial addressing this issue that early colonoscopy (after urgent purge preparation) was not superior to a standard care algorithm (including expectant colonoscopy) in finding the source of bleeding and concerning important outcomes (mortality, hospital stay, transfusions requirements, rebleeding and surgery).¹⁶ Some physicians perform colonoscopy on an unprepared bowel, since blood is laxative and the localisation (height) of blood found in the colon can provide information about the bleeding site. Chaudhry et al¹³ showed that in patients with acute lower gastrointestinal bleeding, a high diagnostic yield (97%) and effective haemostasis could be obtained even without bowel preparation. They were able to control active bleeding in 17/27 patients (63%) by endoscopic intervention. However, current recommendations¹² advise cleansing of the colon as thoroughly as possible in acute lower gastrointestinal bleeding. This improves the evaluation of the mucosa, which in turn enhances recognition of smaller lesions and minimises the risk of complications resulting from poor visualisation. Bowel cleansing is usually performed with an electrolyte solution (polyethylene glycol basis). For optimal preparation of the colon, the patient must consume 3–4 L of the solution. Patients generally

tolerate consumption of 1–2 L per hour. It may be helpful to administer a prokinetic antiemetic such as metoclopramide or to administer the solution through a nasogastric tube. The endoscopist should attempt to reach the caecum whenever possible. This is important because a substantial proportion of bleeding sites are located in the right hemicolon. In addition, the endoscopist should try to intubate the terminal ileum. Flowing blood from above is a clear indication of a more proximal bleeding site. Ohyama et al¹⁴ report that even under conditions of urgent colonoscopy, the caecum was inspected in 56% of patients, and that terminal ileum insertion was achieved in 27%. For diagnosing haemorrhoidal bleeding it is important to inspect the anal transitional zone with a retroflexed instrument and to perform proctoscopy (anoscopy).

The second aim of colonoscopy in acute lower bleeding should be to identify patients with active bleeding or with a risk of rebleeding. By analogy with endoscopic risk stratification in bleeding ulcers, Jensen et al¹⁷ and Grisolano et al¹⁸ have shown that evidence of active bleeding (Figure 2), visible vessels (Figure 3), and adherent clots are associated with a severe course or a high rate of rebleeding.

Nuclear imaging

Nuclear scintigraphy is a sensitive method of detecting gastrointestinal bleeding at a rate of 0.1 mL/min. It is more sensitive than angiography, but less specific than a positive endoscopic or angiographic examination.¹⁹ Two radioactive markers are available: technetium (^{99m}Tc) sulphur colloid, and ^{99m}Tc-labelled red blood cells.

^{99m}Tc sulphur colloid has the advantage that there is no time delay, since the substance does not need to be prepared and can be injected immediately. However, ^{99m}Tc sulphur colloid is rapidly cleared from the intravascular space. Patients

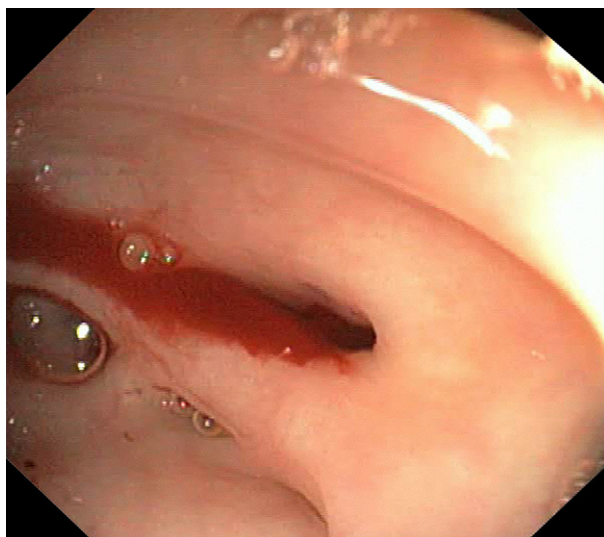


Figure 2. Bleeding from a small diverticulum, recognisable by a streak of red blood.

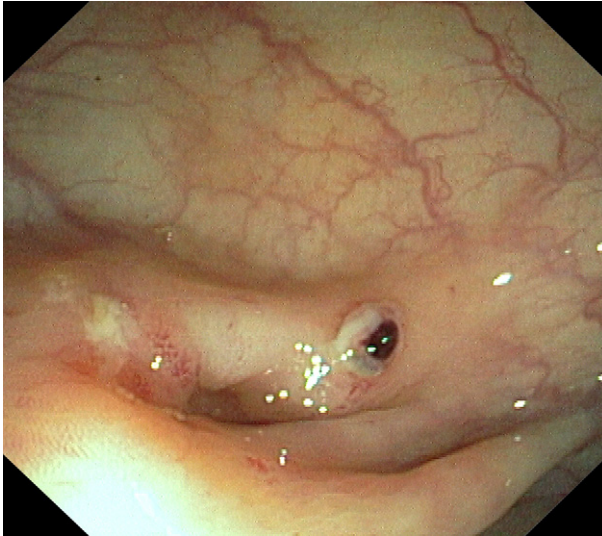


Figure 3. Diverticulum with surrounding erosions and a visible vessel.

must be actively bleeding during the few minutes that the label is present in the vascular space. Therefore, ^{99m}Tc -labelled red blood cells are used in most cases to detect intermittent or acute lower gastrointestinal bleeding. After injection of ^{99m}Tc -labelled red blood cells, abdominal images are made during the first 30 min and then every few hours. Due to the long half-life of the marker, images up to 24 h after administration can be obtained. This is of particular importance in patients with intermittent bleeding. A major disadvantage of nuclear imaging is that it localises bleeding only to an area of the abdomen. For example, bleeding from a redundant sigmoid may appear in the right lower quadrant, suggesting bleeding in the right colon. Another problem is colonic motility, which can move blood in either the peristaltic or the anti-peristaltic direction. Poor localisation of the bleeding source is aggravated by the laxative effect of large amounts of blood. Zuckerman and Prakash⁴ reviewed 16 studies including a total of 1418 scans, of which 635 were positive. The localisation was confirmed by other tests in 343 cases, and the scintigraphic localisation was correct in 269, resulting in an accuracy rate of 78% (ranging from 41% to 97%). The accuracy also depends on the time of scanning.^{19,20} When scans were positive within 2 h, localisation was correct in 95–100% of cases, but with positive scans later than 2 h the accuracy decreased to 57–67%. Scintigraphy has been evaluated as a screening test before angiography: A positive scintigram increased the diagnostic yield of angiography from 22% to 53%.²¹ In contrast, Pennoyer et al found that a positive scintigram had no predictive value for later angiography: 33% of those with negative scintigraphy, 33% of those with positive scans, and 33% of those without scintigraphy had positive angiographic findings.²² Scintigraphy may therefore be a useful tool for intermittent gastrointestinal bleeding when other methods have failed. It is strongly recommended that every positive radionuclide imaging by colonoscopy or angiography be confirmed before definitive therapy – for example emergency surgery – is considered.

Radiology

It is estimated that *visceral angiography* can only detect active bleeding of at least 0.5–1.0 mL/min.^{23,24} The specificity of this procedure is 100%, but sensitivity varies with the pattern of bleeding, ranging in one study from 47% with acute to 30% with recurrent bleeding.²⁵ Indirect signs of a bleeding lesion, such as early filling of angiodysplasia or neovascularity of a neoplasm, suggest, but do not confirm, the bleeding source. Venous bleeding is almost never detected by angiography. The overall yield of angiography for detecting a gastrointestinal bleeding source ranges from 27% to 77%.⁴ Advantages of angiography include the lack of a requirement for bowel preparation, the ability to localise exactly the bleeding source (if identified), and the potential for therapy. However, angiography is not without complications. In a study reviewing 449 consecutive cases with peripheral angiography, the overall complication rate was 9.3%.²⁶ Haematoma, femoral artery thrombosis, contrast reactions, renal failure, and transient ischaemic cerebral attacks were major incidents. Angiography should be reserved for those patients who have massive bleeding that precludes colonoscopy, or who have undergone repeated endoscopies without identification of the source of bleeding.

A study could show that *multidetector computed tomography* is highly sensitive and specific in diagnosing colonic angiodysplasia.²⁷ It seems to be equal to visceral angiography in acute gastrointestinal haemorrhage.²⁸ Bleeding rates <0.4 mL/min were detectable in an animal experiment.²⁹ Accuracy rates of 54–79% for localising colonic bleeding were reported.^{30,31}

There is little if any role for *barium enema*.

THERAPY

Endoscopy

The efficacy of endoscopic intervention in upper gastrointestinal bleeding is now beyond any doubt. Recently, these benefits have also been demonstrated in lower gastrointestinal bleeding.¹⁷ There are basically three methods that are suitable for achieving haemostasis in the ileum and colon:

- *thermocoagulation* (with and without tissue contact);
- *injection therapy* (of various agents);
- mechanical methods.

Regardless of which method is used, three factors seem to be important:

- detection of the source of bleeding;
- identification of stigmata of haemorrhage (by analogy with peptic ulcer bleeding);
- optimal visibility.

Thermocoagulation

Thermal devices deliver heat either directly (heater probe) or indirectly by tissue absorption of light energy (laser) or by electrical current passing through tissue (bipolar

probe, argon plasma coagulation). Heat application causes oedema, coagulation of tissue protein, and contraction of vessels in the tissue resulting in haemostasis.

In *bipolar electrocoagulation* an electrical current passes through the tissue between the two electrodes contained in the probe tip. Unlike monopolar probe use, the current does not pass through the patient's body, but is limited locally to the targeted tissue area. A major problem is that the probe may stick to the tissue; removal of the probe entails the risk of tearing off tissue and inducing bleeding. It should be kept in mind that in the right hemicolon the bowel wall is thinner. Perforation in the right hemicolon occurs in up to 2.5% of patients in whom bipolar coagulation is performed.

Monopolar electrocoagulation requires the placement of a neutral electrode on the patient's body. The electrical current flows from the probe tip through the patient's body. Some models of monopolar probes also have holes in the probe tip for irrigation: e.g., electrohydrothermal (EHT) probes. Coagulation depth is greater in monopolar coagulation than in bipolar coagulation,³² although the level of energy application is more predictable in monopolar probes with irrigation at the tip (EHT probes).

Argon plasma coagulation (APC) transmits energy from ionised argon gas to the tissue without contact between the probe and tissue. Equipment includes a unit for controlling and regulating the supply of argon gas, a high-frequency electro-surgical generator, and a flexible application probe which is inserted into the working channel of the endoscope. Energy passes through the body and is returned by a neutral electrode placed on the skin. Penetration depth of coagulation is 0.8–3.0 mm. Depth of penetration is automatically limited by the desiccation of the tissue. Nonetheless, APC carries the risk of perforation, especially in the thin-walled caecum. Though valid figures on perforation rates are lacking, they are probably well below 1%.

The light produced by a *laser* device has much more energy than normal mixed-colour light. A flexible optical fibre transmits the laser beam. Laser application in gastrointestinal hollow organs has some drawbacks. In the commonly used Nd:YAG laser the optical fibre must be constantly cooled by carbon dioxide, which can cause considerable bowel distension. A further disadvantage is that the laser device is not mobile. The laser light causes coagulation in tissue, which rapidly becomes vaporised. Depth of penetration of a single pulse from an Nd:YAG laser is 0.2–6.0 mm, and with an argon beam laser 1–2 mm. The deeper necrosis makes application in thinly walled hollow organs such as the right hemicolon unpredictable, accounting for the perforation risk. Laser application can be a contact or non-contact procedure.

The *heater probe* tip consists of a Teflon-coated hollow aluminium cylinder with a heating coil inside. The Teflon coating is designed to prevent the probe from adhering to tissue. The temperature at the tip is constant. Coagulation depth achieved using a heater probe is similar to that in bipolar coagulation.³³ Use of heater probes versus bipolar coagulation has been compared only for radiation-induced angiodysplasia in the rectum.³⁴ Efficacy and safety of both methods were equal. There are no data addressing the complication rate for use in the colon.

Injection therapy

Injection therapy is an inexpensive and easy-to-learn method for achieving haemostasis. Injection needles consist of a Teflon sheath with an extendable needle at the tip. For therapy in the colon, a needle extension length of 4 mm should be used in order to limit the depth of penetration. Usually, *epinephrine* (synonyms: suprarenin, adrenaline) is used. The injection achieves haemostasis by both a vasoconstriction effect and also

the resulting compression of the vessel. The individual injection dose should be as low as possible (e.g. 1–2 mL, 1:10,000 dilution) as the absorption of catecholamine has systemic effects (tachycardia, arrhythmia, and hypertension). Alternatively, other agents – such as absolute alcohol, sodium tetradecyl sulphate, ethanolamine and polidocanol – have also been used in injection therapy. The effect of these agents, however, is not superior to that of epinephrine, and moreover they can cause mucosal injury.

Bleeding from rectal varices can often be stopped only by injection of a *cyanoacrylate glue*, as in gastric and oesophageal varices. Mucosal injury caused by extravascular injection can result in deep ulcerations and consecutive rebleeding.

Mechanical methods

There are various reasons for *metal clips* being an attractive alternative to the more common methods of haemostasis. First, clips allow definitive and secure closure of bleeding vessels, and the endoscopist can immediately recognise whether a vessel has been occluded. Another important aspect is that no complications have been reported so far. In a comparative study by Chung et al³⁵ on patients with Dieulafoy lesions, some of which were in the colon, the initial haemostatic effect of metal clipping was clearly superior to injection therapy, and rebleeding was less frequent. Clips are available in different versions with various lengths and angles of the jaws. The sheath with the clip is advanced through the working channel of the endoscope.

Ligation of bleeding haemorrhoids is a proven, simple, and inexpensive treatment method. Under visualisation with a proctoscope (anoscope), suction is applied using a special applicator to an internal haemorrhoid localised above the dentate line. A rubber band is then placed around the base of the suctioned haemorrhoid pile, ligating it. Complications include pain and risk of rebleeding after the band has fallen off.

Other methods

The role of *angiographic intervention* and *surgery* will be discussed in other sections. They should only be considered if colonoscopy has failed or is not possible.

DIFFERENTIAL DIAGNOSIS AND THERAPY

The frequency of the source of colonic bleeding reported varies from one publication to the next. One reason could be that studies often fail to differentiate between probable and definite sources of bleeding. In addition, the definition of acute lower gastrointestinal bleeding is far from uniform. [Table 1](#) provides an overview of the frequencies of bleeding sources. Age can provide a clue to the cause of acute lower gastrointestinal bleeding: younger patients tend to bleed from haemorrhoids, vascular malformation, and rectal ulcers, while older patients tend to bleed from diverticula, vascular malformations, and neoplasms.

Diverticula

Diverticula are the reported source of gastrointestinal bleeding in 17–40% of patients ([Table 1](#)). Although most diverticula are located in the left hemicolon, especially in the sigmoid colon, diverticula in the right hemicolon have a greater tendency to bleed.

Table 1. Distribution of sources of haematochezia reported in the literature.³⁹

Source of bleeding	Frequency (%)
Diverticula	17–40
Vascular malformation (especially angiectasia)	2–30
Colitis (ischaemic, infectious, chronic inflammatory bowel disease, radiation injury)	9–21
Neoplasia, postpolypectomy bleeding	11–14
Anorectal disease (including rectal varices)	4–10
Upper gastrointestinal bleeding	0–11
Small bowel	2–9

However, the correlation may not always be causal, since diverticula are often cited as the bleeding source in the colon for lack of evidence of another source. A recent study identified colon diverticula as the bleeding source in 22% of patients with acute lower gastrointestinal bleeding, based either on active bleeding (Figure 2) or on stigmata such as visible vessels (Figure 3) or an adherent clot.¹⁷ Among patients in the group in which the bleeding source was actively treated with endoscopic therapy (epinephrine injection and bipolar coagulation) there was no rebleeding, compared with 53% of those who did not undergo endoscopic intervention. These excellent results are contradicted, however, by another study³⁶ in which a retrospective analysis of diverticular bleeding was conducted. Using the same endoscopic intervention techniques, this study found early rebleeding in 38% of patients and late rebleeding in 23%. At first glance, the results of these two studies appear contradictory. Yet a closer look reveals that Jensen et al¹⁷ have consistently advised their patients to discontinue use of NSAIDs and acetylsalicylic acid and to follow a high-fibre diet. It is therefore possible that these additional factors help to explain the differing results, and that non-endoscopic factors also play an important role in treatment outcome. About 80% of the bleeding episodes stop spontaneously. The cumulative risk of rebleeding is 25% after 4 years.⁵ A third bleed after a second episode occurs in half the cases. Therefore, surgical resection is recommended after the first rebleeding episode.³⁷ There is no consensus about which endoscopic treatment is optimal. Apart from epinephrine injection and coagulation methods, mechanical haemostasis using metal clips has been used³⁸ to stop diverticular bleeding.

Vascular causes

Angiodysplasia

Angiodysplasias are cited as sources of lower gastrointestinal bleeding in up to 30% of patients (Table 1), although a rate of 3–12% is probably more realistic.³⁹ The majority of angiodysplasias (62%) are located in the right hemicolon, often occurring several at a time. The vast majority of affected individuals do not bleed,^{40,41} and therapy is not always indicated for every angiodysplasia detected by colonoscopy. Consequently, angiodysplasias detected during emergency colonoscopy are not automatically the source of bleeding unless they are observed bleeding or have stigmata (visible vessel,

adherent clot or submucosal bleeding). It is important to avoid the use of opiates^{42,43} and cold-water lavage⁴⁴ during colonoscopy as these reduce blood flow in the mucosa, decreasing the diagnostic yield.

Rectal blood loss is reported in 4–13% patients after radiation therapy of tumours in the pelvis.⁴⁵ In consequence of radiation-induced ischaemia, neovascularisation develops in the mucosa. Chronic radiation injury presents endoscopically with multiple angiectasias in the rectum often extending into the anal canal. Endoscopic thermocoagulation has proved effective in the treatment of angiodysplasias in the colon and rectum. Successful use of heater probes, mono- and bipolar electrocautery, Nd:YAG laser, and argon plasma coagulation (APC) has been reported. Three points should be noted with regard to the practical application of thermocoagulation:

- Low-power and rapid application should be used, especially in the caecum and ascending colon, in order to limit the depth of coagulation. Laser coagulation is not without risk in this region.
- Larger vascular malformations should first be coagulated around their periphery and then in the centre.
- Contact thermocoagulation procedures involve a risk of bleeding as adherent tissue can be torn off when the probe is withdrawn. Non-contact procedures, such as APC, have a distinct advantage.

A special problem is the treatment vascular angiectasias in chronic rectal radiation injury. Among contact procedures, bipolar probes and heater probes were equally successful.³⁴ There are several reports on the use of laser for this indication,⁴⁵ with a complication rate of 0–9%. In order to minimise mucosal injury in this damaged tissue, energy delivery should be kept as low and as short as possible. A recent and promising therapy option is APC. Its success in radiation-induced vascular malformation in the rectum has been repeatedly reported.⁴⁵ As with laser therapy, the power setting should be low and time of application kept short. Several treatment sessions are often necessary.

Varices

Bleeding from rectal varices is not uncommon in patients with portal hypertension. The rectal varices have a grey-blue colour and may be confounded with mucosal folds. In acute bleeding, treatments analogous to those in oesophageal or gastric varices – such as band ligation, sclerotherapy and intravariceal injection of acryl glue – have been reported. In the long run, portosystemic shunting (transjugular intrahepatic portosystemic shunt, TIPS) appears to be a more successful approach.⁴⁶

Dieulafoy ulcer

Bleeding from a Dieulafoy lesion in the stomach is not an unusual finding, but it is an unexpected cause of colonic bleeding. Small mucosal lesions with subsequent erosion of an underlying vessel can lead to spurting haemorrhage. Successful achievement of endoscopic haemostasis has been (casuistically) reported using injection of sclerosing agents, thermocoagulation, and haemoclips. Mechanical methods of haemostasis (metal clip and band ligation) seem to be more effective than injection therapy.³⁵

Ischaemia

Haematochezia is not infrequently caused by colonic ischaemia. Submucosal haemorrhage, livid-coloured mucosa, and mucosal nodularity are typical endoscopic findings in the early stages. The resulting bleeding does not usually cause haemodynamic compromise and is self-limiting in most cases.

Colitis

Chronic inflammatory bowel disease (IBD)

Heavy bleeding is responsible for 6–10% of emergency surgical procedures in patients with ulcerative colitis; ulcerative colitis is the bleeding source in 2–8% of cases.³⁹ Massive haemorrhaging leads to hospitalisation in 0.1% of patients with ulcerative colitis and 1.2% of patients with Crohn's disease.⁴⁷ Among Crohn patients, bleeding localisation has been said to be evenly distributed through the small bowel and colon.⁴⁷ This contrasts with two other studies: one citing the colon⁴⁸ and the other the ileocolonic junction⁴⁹ as the bleeding sites of predilection. In half of all patients with bleeding related to IBD, cessation of bleeding is spontaneous; however, the rate of rebleeding is 35%.⁵⁰ In the majority of cases bleeding is diffuse. If there are circumscribed bleeding sources, they can be treated endoscopically. Epinephrine injection and bipolar coagulation⁴⁷ were successful in achieving haemostasis, as were injection of a mixture of absolute alcohol and polidocanol⁵¹ and application of metal clips.⁵²

Infectious colitis

Although infectious colitis, as well as pseudomembranous colitis, can present with bloody diarrhoea, life-threatening haemorrhage is rare. Endoscopic intervention is generally not necessary.

Non-steroidal anti-inflammatory drugs (NSAIDs)

NSAIDs can promote bleeding from any number of possible lesions in the gastrointestinal tract. NSAIDs also induce colitis, which may not be visibly distinguishable from infectious colitis or IBD. The endoscopic aspect can also include flat and usually irregularly bordered erosions and ulcerations which are surrounded by an otherwise normal-appearing mucosa. There are no recommendations for endoscopic therapy. In practice, injection (epinephrine) therapy or clipping devices have been effective.

HIV infection

The causes of lower gastrointestinal bleeding in patients with HIV differ from those in other patients. The most common are cytomegalovirus colitis (25%), lymphoma (12%), and idiopathic (unidentifiable) colitis (12%).⁵³ The first two causes are especially pronounced in patients with a CD4 lymphocyte count <200/mm³. If cell count is >200/mm³ the most common bleeding sources are idiopathic colitis, diverticula, and haemorrhoids. Rebleeding is not uncommon. Thirty-day mortality related to bleeding is around 14%, and patients with concomitant medical problems or rebleeding and those requiring operative intervention are especially at risk. In a study by Bini et al,⁵³ bleeding was controlled endoscopically in nearly all patients by means of bipolar

thermocoagulation probes, with or without epinephrine injection. In a study by Chalasani et al,⁵⁴ the most common cause of bleeding was also cytomegalovirus infection, followed by haemorrhoids and anal fissures. Thrombocytopenia was a particular risk factor for haemorrhoid bleeding. Histoplasmosis of the colon, Kaposi's sarcoma in the colon, and bacterial colitis are further possible sources of bleeding.

Neoplasia

Carcinoma

Carcinomas account for 2–9% of cases of haematochezia. Bleeding is the result of erosions on the surface of the tumour. Both laser and APC allow endoscopic haemostasis by means of non-contact thermocoagulation. Contact methods are less suitable because tearing of tissue after completion of coagulation can cause haemorrhagic oozing. Injection of absolute alcohol into the tumour has also been successful in achieving haemostasis.⁵⁵ Metal clips can be tried in case of circumscribed bleeding sources.

Colon polyps (including postpolypectomy bleeding)

Colon polyps are cited in 5–11% of patients as the source of acute lower gastrointestinal bleeding. Larger polyps with a diameter >1 cm bleed more often. By far the most common cause of lower gastrointestinal bleeding from benign polyps is polypectomy. Bleeding may occur immediately after resection, although the time between polypectomy and bleeding can vary and can occasionally be up to 2 weeks. In the event of early postpolypectomy bleeding, haemorrhage can be controlled in many cases by resnaring the stalk of the polyp and applying pressure (with or without application of coagulation current). If this fails, various endoscopic techniques have proved safe and effective. These include loop or rubber-band ligation of the remaining polyp stalk, thermocoagulation with or without preceding epinephrine injection, and application of metal clips.³⁹

Anorectal diseases

Haemorrhoids

Haemorrhoids are the source in 2–9% of patients with acute lower gastrointestinal bleeding.³⁹ Ligation of internal haemorrhoids using rubber bands has proved an effective and simple method for treating haemorrhoid bleeding. Jensen et al⁵⁶ compared bipolar coagulation with heater probe as therapies for bleeding internal haemorrhoids. Pain was more often reported with heater probe use, yet the success of therapy compared with BICAP (bipolar coagulation probe) was more evident and appeared more rapidly. Bleeding after haemorrhoid operation or band ligation is also seen on occasion. Mechanical haemostasis using clip devices, as well as epinephrine injection, have proved effective.

Anal fissures

Although anal fissures often cause bloody stools, acute bleeding is rare. Fissures are relatively easily diagnosed by inspecting the anus. The patient typically has severe pain upon spreading the anus, but the lesion can be carefully and painlessly inspected

after injecting a few millilitres of a local anaesthetic. Bleeding from fissures usually ceases spontaneously. If necessary, haemostasis can be attempted by injection of an epinephrine solution or with a swab soaked in epinephrine placed in the anus.

Solitary rectal ulcer

Local ischaemia appears to play a role in the pathogenesis of solitary rectal ulcer. Internal rectal prolapse or lack of inhibition of the puborectalis muscle during straining are often incriminated. Heavy bleeding is rare. Thermocoagulation, injection therapy, or clipping devices can be used for endoscopic haemostasis.

SUMMARY

Acute lower gastrointestinal bleeding is less frequent than haemorrhage from the upper gastrointestinal tract, and it presents less dramatically. Patients usually complain of haematochezia, less frequently of melaena. Colonic diverticula and angiodysplasias are the main causes of acute lower gastrointestinal bleeding. Lower gastrointestinal haemorrhage may lead to haemodynamic instability, anaemia, or the need for blood transfusion. Resuscitation in haemodynamically unstable patients includes fluid replacement and (if necessary) blood transfusion. Any coagulopathy present should be corrected. Risk factors for ongoing and recurrent haemorrhage are an increased heart rate, low blood pressure, low haematocrit, syncope, non-tender abdomen, gross blood on initial rectal examination, use of acetylsalicylic acid, and comorbid conditions. These patients should be monitored in an intensive care unit.

Colonoscopy is the mainstay of the patient's evaluation. Urgent colonoscopy is done to localise the bleeding source, to identify patients at risk of ongoing or recurrent bleeding, and to perform haemostasis. The timing of endoscopy is still a matter for debate in haemodynamically stable patients, as is need for bowel cleansing before urgent colonoscopy. Visceral angiography and nuclear imaging are done only in patients in whom colonoscopy is not feasible or has repeatedly failed to localise the bleeding source. Multidetector computed tomography seems to be equal to visceral angiography in diagnosing colonic bleeding.

Endoscopic haemostasis techniques include thermocoagulation, injection therapy, and mechanical devices.

Practice points

- Lower-gastrointestinal-tract bleeding is less frequent and has a less dramatic presentation than upper-gastrointestinal-tract haemorrhage.
- In most cases bleeding will stop spontaneously.
- Haemodynamically unstable patients and those with ongoing bleeding must be resuscitated first.
- Only high-risk patients need be monitored in an intensive care unit.
- Colonoscopy is the mainstay of the diagnostic evaluation. Angiography and nuclear imaging are required only in those patients in whom colonoscopy has failed to identify the bleeding source.
- Endoscopic haemostasis is successful in most cases; thermocoagulation, injection therapy, and mechanical devices are used in clinical practice.

Research agenda

- Prognostic indices for identification of high-risk patients should be refined and tested in clinical practice.
- The role of urgent colonoscopy must be better defined.
- The timing of endoscopy and the optimal preparation still need to be resolved.
- It must be clarified whether the risk stratification of peptic ulcer bleeding based on the endoscopic findings can be assigned to colonoscopic findings in lower gastrointestinal haemorrhage.
- The optimal endoscopic therapy must be defined in terms of success rate, cost-effectiveness, and simple practicability for the different bleeding sources.

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