Acute lower gastrointestinal bleeding: Part 2

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R Enns. Acute lower gastrointestinal bleeding: Part 2. Can J Gastroenterol 2001;15(8):517-521. Diagnostic strategies for lower gastrointestinal bleeding include nuclear scintigraphy, mesenteric angiography and endoscopic evaluation of the lower gastrointestinal tract. Each method has inherent advantages and disadvantages. Nuclear scintigraphy is simple and noninvasive, but high rates of false localization have led most clinicians to insist on confirmation of the bleeding site by another method before considering surgical intervention. Angiography is very specific, but is invasive and not as sensitive as nuclear scintigraphy. Colonoscopy is sensitive and specific, and can offer therapeutic value but can be technically challenging in the face of acute lower gastrointestinal hemorrhage. These strategies and the evidence behind them are discussed.

Key Words: *Colonoscopy; Endoscopy; Lower gastrointestinal bleeding; Mesenteric angiography; Nuclear scintigraphy*

Hémorragie digestive basse aiguë : 2e partie

RÉSUMÉ : Les examens diagnostiques pour les hémorragies digestives basses comprennent la scintigraphie, l'angiographie mésentérique et l'évaluation endoscopique du tractus gastro-intestinal inférieur. Chaque examen a ses avantages et ses inconvénients. Ainsi, la scintigraphie est simple et non effractive, mais son taux élevé de faux emplacements incite la plupart des cliniciens à confirmer le foyer d'hémorragie par un autre examen avant de procéder à une intervention chirurgicale. L'angiographie, pour sa part, s'avère très spécifique, mais elle est effractive et ne se montre pas aussi sensible que la scintigraphie. Quant à la coloscopie, elle est à la fois sensible et spécifique, et peut aussi jouer un rôle thérapeutique, mais elle pose un défi technique dans les cas d'hémorragie digestive basse aiguë. Tel est l'objet du présent article : les examens et les preuves à l'appui.

DIAGNOSTIC STRATEGIES OF LOWER GASTROINTESTINAL BLEEDING

Following a thorough history and physical examination, including examination of the anorectal region (with a rigid or flexible sigmoidoscope), three primary tools are used to aid in the localization and identification of a bleeding source in the colon: nuclear scintigraphy, mesenteric angiography and colonoscopy. The latter two tools may also provide therapy.

NUCLEAR SCINTIGRAPHY

Radioisotope scanning can detect gastrointestinal bleeding rates as low as 0.1 mL/min (1-6). The general principle is to inject a radioactive substance that will extravasate into the bowel at the bleeding point, thereby localizing the site of bleeding. By viewing the initial site of extravasation, and allowing the contrast to accumulate and travel distally through peristalsis, the exact site of bleeding (small bowel versus colon) can theoretically be determined. Two types of scintigrams are available: those using sulphur colloid and those using autologous red blood cells, both of which are 'tagged' with technetium^{99m} (Tc^{99m}). The advantage of Tc^{99m} sulphur colloid is that it requires no preparation and can, therefore, be injected into the patient immediately. Unfortunately, it is rapidly cleared by the reticuloendothelial system, having a half-life of only 2 to 3 min. This is its primary disadvantage; if the scan is not immediately positive, the radioactive substance cannot be detected on

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TABLE 1
Diagnostic accuracy of technetium^{99m}-labelled red blood cell scans for lower gastrointestinal hemorrhage

Author (reference)	Patient	Extravasation (%)*	Correct (%)	Incorrect (%)
Bentley and Richardson (56)	98	47	52	48
Bunker et al (10)	41	98	95	5
Hunter and Pezim (1)	203	26	42	58
Kester et al (57)	37	30	82	18
McKusick et al (11)	51	92	83	17
Szasz et al (58)	46	80	81	19
Winzelberg et al (59)	62	94	83	17

**Extravasation of radioactive material into the bowel, presumed to be the site of active bleeding*

delayed images. Furthermore, it tends to accumulate in the spleen and liver (areas of uptake by the reticuloendothelial system), occasionally obscuring the site of bleeding (7,8).

Generally, Tc^{99m}-labelled red blood cell scanning is preferred over sulphur colloid scanning because of its long half-life (bleeding can be detected on images taken up to 24 h later) (9-11). If bleeding is rapid, a positive result can be seen within as little as 5 min (12). Patients whose initial scans are negative may show bleeding on subsequent scans over the following 12 to 24 h as labelled red blood cells accumulate in the lumen near the site of hemorrhage.

Although appealing in theory, the role of nuclear scintigraphy in the evaluation of lower gastrointestinal bleeding is unclear. Overlapping bowel and migration of Tc^{99m}-labelled blood cells within the intestine (occasionally upstream) complicate interpretation and have led to false localization rates of up to 59% (13,14). Although some authors have reported a very high sensitivity of 73% to 100% in the localization of the bleeding site (15), others have found an overall failure rate of 85% with this method (16), with up to 42% of patients subsequently undergoing a nontherapeutic surgical procedure based on a false-positive scan (1).

Because of these concerns, or if patients are bleeding too slowly for angiographic diagnosis, most centres use nuclear scintigraphy only as a prelude to the more invasive, and expensive, angiography (Table 1). If the nuclear scan is positive, it may help guide the angiographer to the appropriate vessel, presumably minimizing the amount of contrast and manipulation necessary to find the bleeding site. If the nuclear scan is negative, then an angiogram is unlikely to reveal a site of active bleeding, but it still might be useful to depict vascular abnormalities (ie, angiodysplasia). Because of a high false localization rate, surgical intervention should not proceed simply on the basis of a positive scintigram. The bleeding site must be confirmed through either colonoscopy or angiography. Patients with massive lower gastrointestinal hemorrhage should proceed directly to other imaging modalities because nuclear scanning may simply delay their therapy (17,18).

TABLE 2
Localization of bleeding sites using mesenteric angiography

Author (reference)	Number of patients	Bleeding sites localized (%)
Boley et al (25)	43	65
Britt et al (28)	40	58
Browder et al (29)	50	72
Casarella et al (32)	69	67
Colacchio et al (27)	98	41
Leitman et al (26)	68	40
Nath et al (51)	14	86
Ryan et al (2)	2	0
Uden et al (31)	28	57
Wagner et al (18)	17	13
Welch et al (30)	26	77

MESENTERIC ARTERIOGRAPHY

Selective mesenteric angiography is a valuable tool to detect and potentially treat (via Pitressin infusion or embolization) sites that are bleeding at rates faster than 0.5 to 1 mL/min (19-23). Originally described in the 1960s, the technique is performed following placement of a transfemoral arterial catheter. The superior mesenteric artery is usually injected first because bleeding most commonly originates in its branches (23,24). The initial vessel to be injected can be chosen according to the results of nuclear scintigraphy. If no bleeding site is found with injection of the first vessel, all three arteries (superior mesenteric, inferior mesenteric and celiac) are evaluated. The hallmark of a positive examination result is contrast extravasating into the bowel lumen. Even if no bleeding is present, occasionally a vascular pattern seen on angiography can indicate a specific diagnosis (angiodysplasia).

The sensitivity of angiography ranges from 40% to 86% depending on the study (Table 2) (2,22,25-32). This wide variation likely reflects different thresholds for the use of angiography in patients with varying amounts of hematochezia. False-negative results may be secondary to the intermittent nature of lower gastrointestinal bleeding, which may be caused by arterial vasospasm (31,32). Complication rates of angiography approach 4% (20,24,33,34). If results of the angiography are negative, presumably the patient has stopped bleeding and further investigations (colonoscopy) can be done on a more elective basis. If angiography reveals the site of hemorrhage, therapeutic intervention should be considered. Vasopressin infusions or selective arterial embolization can be performed radiologically or, alternatively, it may help determine the appropriate surgery.

Vasopressin infusions of 0.2 U/min to 0.4 U/min stop bleeding in up to 80% of patients by inducing arteriolar vasoconstriction and bowel wall contraction. Vasopressin is

TABLE 3
Diagnostic and therapeutic outcome of colonoscopy in lower gastrointestinal bleeding

Author (reference)	Number of patients	Transfusion requirements (number of units)*	Diagnostic success (%)	Therapeutic attempts (number per patient)	Therapeutic success (%)†
Wagner et al (18)	45	3	56	2	100
Rossini et al (3)	409	N/A	76	28	–
Jensen and Machicado (7)	80	6.5	74	32	–
Caos et al (46)	35	4.8	69	12	92
Kouraklis et al (49)	59	3	51	–	–
Richter et al (16)	78	4	90	13	69

**Preoperatively during present hospitalization; †Therapeutic success was defined as cessation of bleeding following a therapeutic manoeuvre. N/A Not applicable*

generally continued for 12 to 48 h and then tapered off. Unfortunately, 50% of patients rebleed during the same hospitalization (19,22,26,29,35-40). The complications of vasopressin centre on its vasoconstrictive properties and include angina, mesenteric infarction, peripheral ischemia, hypertension, arrhythmia, hyponatremia and death. Some patients, especially those with concomitant coronary artery disease or peripheral vascular disease, can be managed simultaneously with nitroglycerin infusions to ameliorate these complications. The multiple complications of this treatment clearly should be balanced against the possible benefit of therapy. Alternatives such as surgical resection must always be considered for appropriate patients. In many circumstances, vasopressin infusions can be used as a temporizing method before surgical intervention (resection) or, in cases of vasopressin failures, angiographic embolization.

In 1972, angiographic embolization was performed successfully for the first time and described by Rosch et al (41). The procedure involves placement of an angiographic catheter into a distal bleeding branch and embolizing selectively with agents such as coil springs, oxidized cellulose, gelatin sponge or polyvinyl alcohol. Selected patients from very small series demonstrate success rates ranging from 71% to 100% (39). The rebleeding rate appears to be relatively low, although several investigators (17,26) continue to be concerned about the possibility of bowel infarction (reported in two series) (26,39). This complication results from the inability to embolize distal branches selectively. Because embolization carries considerable risk, is cumbersome and may at times delay definitive surgical intervention, it likely should be reserved for patients who have significant comorbid disease that makes definitive surgery prohibitive.

COLONOSCOPY

The advent and expanded use of colonoscopy have dramatically changed the investigative pattern of lower gastrointestinal bleeding. Colonoscopy is clearly the diagnostic modality of choice in patients who have stopped bleeding and in those who can be prepared adequately. Usually, it can be done over the next 24 to 48 h, depending on the clinical circumstances and ease of availability of endoscopy. Colonoscopy has been shown to be a useful method of investigation even if contrast studies are negative or reveal only diverticular disease (42-44).

Colonoscopy is more difficult in patients with massive or ongoing lower gastrointestinal hemorrhage. Before initiating invasive investigations such as colonoscopy, upper gastrointestinal bleeding and perianal bleeding need to be excluded. This can usually be accomplished by a negative nasogastric aspirate (or upper endoscopy) and perianal examination combined with flexible sigmoidoscopy.

In the case of massive colonic bleeding, colonoscopies tend to be more difficult and usually involve a purge preparation with a polyethylene glycol solution (unless renal failure is present). It can be administered in large predetermined volumes or given until the rectal effluent is clear. The preparation can be given orally or, if this is not possible, via a nasogastric tube. One to 2 L/h are given until the rectal effluent becomes clear (usually 5 to 6 L total). Patients must be monitored carefully, but electrolyte imbalances and other complications are rare. Metoclopramide can be used to accelerate gastric emptying and alleviate nausea (7,8,45). Some have argued that because blood is a cathartic, preparation of the colon is unnecessary in patients with significant lower gastrointestinal bleeding. Success rates of colonoscopy in massive hemorrhage vary, but diagnostic accuracies of up to 82% have been reported (3,7,8,17,18,21,35,44-50). Cecal intubation in emergency colonoscopy is not always undertaken or necessary if the site of bleeding is noted and clearly documented to be distal to the right colon.

In addition to its diagnostic capabilities, colonoscopy offers an opportunity for therapeutic intervention. Numerous reports of therapeutic techniques have been published. The largest series are summarized in Table 3. Up to 40% of colonoscopies for acute lower gastrointestinal bleeding have etiologies that are amenable to endoscopic therapeutic intervention (7). This includes such interventions as polypectomy, diverticular injections, injection of polypectomy stalks and treatment of angiomata. Argon, bicap and heater probes have all been used for controlling bleeding angiomata (the most common type of lesion amenable to therapeutic intervention). Bicap is the most convenient and most often used endoscopic coagulation method. In patients who have therapeutic interventions, success rates

are relatively high, with most patients avoiding surgical intervention (7).

Urgent colonoscopy in the setting of active lower gastrointestinal hemorrhage can be challenging. Results of therapeutic interventions in this setting have been published through expert endoscopists whose experience may not be applicable to all centres. This is not an area for the 'casual' endoscopist. These procedures require supportive nursing staff and appropriate preparation for therapeutic procedures, including availability of packed red blood cells, large-bore intravenous access and familiarity with the use of different endoscopic hemostatic methods.

OPERATIVE THERAPY

Overall, 25% of patients require a surgical procedure, usually for persistent hemorrhage resulting in hemodynamic instability. Provided that the site of bleeding has been accurately located by colonoscopy or angiogram, directed segmental resection results in low morbidity (0% to 13%) and is highly successful in stopping bleeding (85% to 99%) (22,25,27-30,32,35,51). Every attempt, including intraoperative endoscopy, should be made to avoid 'blind' segmental hemicolectomy because of its prohibitive risk of rebleeding and associated high mortality (up to 50%) (32,35,48,52). When the site of hemorrhage has not been determined preoperatively, on-table colonoscopy in the operating room has been shown in one study to determine the bleeding site in seven of nine cases (53).

If the bleeding site is still not determined by intraoperative colonoscopy, the use of enteroscopy (especially if not performed preoperatively) should be considered. A push enteroscope or a pediatric colonoscope can be used to evaluate the small bowel. The diagnostic rates, if done on a preoperative basis, are approximately 25%. The intraoperative yield is likely similar. The ability at laparotomy to 'intussuscept' the bowel over the enteroscope may allow more of the small bowel to be visualized (36,54,55).

SUMMARY

Lower gastrointestinal bleeding remains a difficult diagnostic and therapeutic problem. Most patients have lower gastrointestinal bleeding that stops spontaneously. These patients can be investigated by colonoscopy over the 24 to 48 h following a standard colonic preparation. For the 15% of patients whose bleeding continues, identification of the bleeding site is critical for subsequent management. Colonoscopy should be performed on an urgent basis by experienced endoscopists who are skilled in the management of coagulation techniques. With this approach, most patients can be triaged to endoscopic therapy or operative therapy accordingly with a low morbidity and mortality as well as low incidence of rebleeding. Bleeding sites demonstrated on nuclear scans (if used) should be confirmed by angiography before surgical intervention because of the poor localization capabilities of nuclear scans of the bowel. Unfortunately, good randomized studies in the assessment of lower gastrointestinal bleeding are not available. However, retrospective and prospective case series seem to indicate that, in appropriate hands, emergency colonoscopy can be safe and sensitive. Because colonoscopy also offers a therapeutic role (in addition to a diagnostic one), whenever possible, it should be the investigative method of choice for lower gastrointestinal hemorrhage.

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