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Techniques in Vascular and Interventional Radiology

Management of Acute Lower Gastrointestinal Bleeding

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Acute lower gastrointestinal bleeding (LGIB), defined as hemorrhage into the gastrointestinal tract distal to the ligament of Treitz, is a major cause of morbidity and mortality among adults. Overall, mortality rates are estimated between 2.4% and 3.9%. The most common etiology for LGIB is diverticulosis, implicated in approximately 30% of cases, with other causes including hemorrhoids, ischemic colitis, and postpolypectomy bleeding. Transcatheter visceral angiography has begun to play an increasingly important role in both the diagnosis and treatment of LGIB. Historically, transcatheter visceral angiography has been used to direct vasopressin infusion with embolization reserved for treatment of upper gastrointestinal bleeding. However, advances in microcatheter technology and embolotherapy have enabled super-selective embolization to emerge as the treatment of choice for many cases of LGIB.

KEYWORDS Acute lower gastrointestinal bleeding, hemorrhage, embolization

Clinical Evaluation/Indication

Initial management of a patient presenting with acute lower gastrointestinal bleeding (LGIB) should focus on securing intravenous access and initiating fluid resuscitation with crystalloids or blood products if necessary. Any underlying coagulopathy or thrombocytopenia should be promptly corrected.

Further evaluation of the patient's clinical status will direct management. A valuable method for categorizing patient status is described in the American College of Radiology (ACR) Appropriateness Criteria.[1] Based upon these criteria, patients presenting with hematochezia or melena who are hemodynamically stable should first undergo colonoscopy. However, endoscopic evaluation may be limited by either inadequate bowel preparation or due to active bleeding, which can obscure visualization of colonic mucosa. In these patients, noninvasive radiographic studies such as computed tomography angiography (CTA) and ^{99m}Technetium-labeled red blood cell (RBC) scintigraphy can be performed. Although these 2 modalities are given equal appropriateness ratings by ACR Criteria, CTA is preferred at our institution as this modality has greater accuracy in localizing the source of the hemorrhage[2] in addition to providing valuable ancillary data regarding patient anatomy and underlying pathology. Furthermore, recent data from within our institution indicates that positive findings on CTA are corroborated on transcatheter visceral angiography (TVA) significantly more often compared to RBC scintigraphy.

For patients presenting with LGIB and hemodynamic instability, defined as systolic blood pressure ≤90 mmHg, or who require more than 5 units of blood, ACR Criteria indicates that the most appropriate intervention is TVA. Even in these patients, however, we will perform a preprocedural CTA if it can be completed without delay of TVA.

Contraindications

There are no absolute contraindications for TVA, particularly when a patient is presenting with life-threatening LGIB. For patients with a history of severe contrast allergy, pre-treatment with corticosteroids can be considered, and intubation for airway protection should be considered. Alternatively, carbon dioxide (CO_2) may be used as a contrast agent.[3]

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Equipment Needed

The choice of equipment used for super-selection of mesenteric arteries will often depend on product availability, patient anatomy, and physician preference. A wide range of guide and microcatheter systems are used at our institution.

Available embolic agents for super-selective embolization (SSE) include Gelfoam (Pharmacia and Upjohn Co, Kalamazoo, MI), particles, microcoils, *n*-butyl cyanoacrylate (NBCA) glue (Codman Neuro, Warren NJ), and ethylene vinyl alcohol copolymer (Onyx) (ev3, Plymouth, MN). In the absence of robust clinical trials comparing the relative efficacy of embolic agents, operator preference often dictates which agent is used. Microcoils are the most commonly used embolic agent at our intuition. However, there are particular clinical situations in which other embolics may be preferred. If bleeding is nonfocal or if the microcatheter cannot be advanced directly adjacent to the bleed, flow-directed polyvinyl alcohol of a minimum size of 300 μm may be used.[4] For patients with uncorrectable coagulopathy, the use of a liquid casting agent such as NBCA or Onyx may be considered as these agents do not require thrombus formation in order to create vessel occlusion.[5,6]

Overcoming Technical Challenges

Distinguishing a true source of hemorrhage on TVA may be difficult especially when patient motion or peristaltic bowel activity results in misleading artifacts on digital subtraction angiography. Reviewing suspicious findings on nonsubtracted imaging may alleviate uncertainty in this setting. Additionally, administration of 1 mg intravenous glucagon prior to TVA will often successfully arrest bowel peristalsis.

Occasionally, extravasation seen during evaluation of a parent vessel may not be able to be reproduced after further selection is performed. This may be due to temporary vasospasm of the bleeding vessel. If vasospasm is suspected, an aliquot of 100-200 μg of nitroglycerine can be injected intra-arterially.

Given the intermittent nature of LGIB, a frequent challenge encountered during TVA is inability to corroborate positive findings observed on preprocedural imaging. For example, given the high sensitivity of RBC scintigraphy along with its prolonged acquisition time, PPV for this modality has been reported to be as low as 24%.[7] In the setting of nonrevealing TVA, one may consider the use of CO_2 contrast. The extremely low viscosity of CO_2 allows for easy delivery through even the smallest diameter microcatheters and, as some have argued, may even confer a higher sensitivity for active LGIB.[3] Alternatively, use of cone-beam CT with accompanying vessel-tracking software, if available, may improve detection of bleeding and expedite selection of the culprit vessel.[8] Finally, one may consider provocative angiography using systemic heparinization and selective injection of a vasodilator along with tissue plasminogen activator (tPA).[9] At our institution, however, this approach is typically reserved for patients with obscure LGIB who have repeatedly negative TVAs.

Recognizing and Treating Complications

Complications from TVA include those associated with arteriography and include bleeding, hematoma, or pseudoaneurysm at the at the access site. Although nontarget embolization may occur, a more common complication of SSE is bowel ischemia. This occurs more often in the lower gastrointestinal tract due to the lack of extensive collateral networks seen in the upper tract. Minor ischemia manifesting as abdominal pain with or without increase in serum lactic acid levels is not uncommon. Major ischemia requiring surgical resection occurs in 1.3%-5% of patients.[10,11] Risk of ischemia is directly proportional to the extent of vascular territory embolized with animal models showing a substantially increased risk when ≥4 vasa recta are embolized.[12,13]

Clinical Follow-Up

In addition to monitoring for access site complications, clinical observation should focus on hemodynamic status and serial hemoglobin and hematocrit levels to determine if there is continued resolution of bleeding. Stool character is a less reliable predictor of persistent bleeding as continued passage of blood may represent residua of earlier bleeding. Routine monitoring of serum lactic acid is not necessary following embolization but is appropriate if the patient develops severe and progressive abdominal pain. Temporary abdominal pain or a transient rise in lactic acid warrants further evaluation if either fails to resolve. Cross-sectional imaging or endoscopy may be necessary to assess for bowel infarction.

Expected Outcomes

TVA with SSE is highly effective in treating acute LGIB with technical success rates as high as 96.4%-100%.[14,15] Clinical success rates are somewhat lower, ranging from 63.0%-91.2%, often due to rebleeding following embolization.[15,16] Notably, thrombocytopenia prior to SSE is strongly associated with clinical failure.[17]

Case 1

A 91-year-old man with a history of bladder cancer, prostate cancer, and diverticular bleeding presented from an outside rehabilitation facility with hematochezia. Upon presentation, the patient had a blood pressure of 115/65 and required 3 units of packed RBCs within a 24-