Acute Lower Gastrointestinal Hemorrhage: Minimally Invasive Management with Microcatheter Embolization

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PURPOSE: To evaluate the efficacy of superselective embolization therapy in the management of acute lower gastrointestinal (LGI) hemorrhage, including any bleeding distal to the ligament of Treitz.

MATERIALS AND METHODS: Between June and August 2007, 20 patients with acute LGI bleeding underwent superselective transcatheter arterial embolization (TAE) at the authors' institution. The bleeding had different causes. All patients were treated with use of microcatheters. The following embolic agents were used: microcoils (n = 16), polyvinyl alcohol (PVA) particles (n = 2), and a combination of microcoils and PVA particles (n = 2). Outcome measures included technical success (complete cessation of bleeding as documented at completion angiography), clinical success (resolution of signs or symptoms of LGI bleeding within 30 days after TAE), and the rate of major and minor complications.

RESULTS: The identified bleeding sources were as follows: jejunal branch, branch of middle colic artery, branch of ileocolic artery, ileal branch, branch of left colic artery, branch of sigmoid artery, branch of the superior rectal artery, and branch of the middle rectal artery. Technical success with effective control of active bleeeding was achieved in all patients (100%). Clinical success attributed to TAE was documented in 18 of the 20 patients (90%). Major complications included death due to pulmonary embolism, heart infarction, and multiorgan failure in the 3rd week after TAE; a procedure-related colonic infarction occurred in one patient. A minor complication occurred in one patient who developed a groin hematoma.

CONCLUSIONS: Superselective embolization may be used for effective, minimally invasive control of acute LGI bleeding.

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Abbreviations: LGI = lower gastrointestinal, PVA = polyvinyl alcohol, TAE = transcatheter arterial embolization.

ACUTE lower gastrointestinal (LGI) hemorrhage is typically caused by diverticular disease, angiodysplasia, neoplasms, or inflammatory disease (1–3). It is a disorder with a reported incidence of 2%–20% (2–5). Normally, LGI bleeding is intermittent and self-limiting and can be treated medically (3,5). In 10%–15% of patients with acute LGI hemorrhage, however, aggressive therapy may become necessary because bleeding may extend to a life-threatening condition (3,5,6). Treatment strategies in these patients include surgery, endoscopy, transcatheter vasopressin infusion, or transcatheter arterial embolization (TAE) (4–11).

Historically, surgical intervention is the method of final resort in the treatment of massive LGI bleeding (4,5). Apart from an increased morbidity rate, surgical procedures may fail because the source of bleeding is not always apparent (5). In this context, an approach with blind subtotal colectomy may be associated with a mortality rate of up to 30% (2,5,10).

To date, endoscopy combined with cautery is considered to be the first-line method to detect and treat LGI bleeding (7). Nevertheless, endoscopic identification of the source artery may be limited by the amount of blood and feces present in the LGI system (6,7). Transcatheter vasopressin infusion has been reported to be highly effective in the initial control of LGI bleeding (8). However, the rebleeding rate and the high incidence of complications have called this approach into question (1,8).

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With the advent of newer coaxial microcatheter systems, the development of more compatible embolizing agents, and the improvement of embolization techniques, there has been a renewed interest in TAE for lower gastrointestinal hemorrhage (11–19). Meanwhile, it is a commonly held opinion that superselective TAE is a safe and effective procedure for controlling massive LGI hemorrhage (1,3,6,12,15). Because the blood supply of the LGI tract is not as rich as that of the upper alimentary tract, some authors have already emphasized the advantages of superselective microcatheter embolization, which enables more accurate superselective hemostasis and, thus, preservation of collateral blood flow (1,3,6,11). Despite these facts, there is still some uncertainty with regard to the postembolic infarction rate in terms of data from modern TAE, especially in small bowel bleeding (3,6,11,15,18). In addition, studies assessing superselective TAE in the treatment of lower LGI bleeding do not always operate with uniformly defined endpoints, making a direct comparison more difficult (6,11).

Consequently, to address the need for more data, we evaluated our experiences with superselective microcatheter embolization in the setting of acute LGI hemorrhage with special focus on the postembolic infarction rate and current reporting guidelines. In contrast to several other trials (6,9,18,19), our study provides exact information on the level of both attempted and actually performed superselective TAE (vasa recta or marginal artery), a fact that may have influenced the overall outcome. Furthermore, to our knowledge, a subgroup of patients who underwent microcoil TAE of the small bowel represents one of the largest in the reported literature.

MATERIALS AND METHODS

Study Sample

We retrospectively reviewed the archives of our interventional radiology department to identify 20 patients (six women, 14 men; mean age, 60 years ± 17; age range, 26–86 years) who had undergone diagnostic angiography and superselective microcatheter embolization to control acute LGI hemorrhage between June 1997 and August 2007. Fourteen of the patients (70%) were more recently treated during a span of 5 years. LGI hemorrhage was defined as any bleeding originating from a source distal to the ligament of Treitz. Seven patients had a hemodynamically unstable condition. Fourteen patients underwent screening examinations before angiography to detect active LGI bleeding (colonoscopy in nine patients and adominal computed tomography [CT] in five). Six patients were directly referred for emergent angiography without undergoing a screening investigation. Causes for bleeding were diverticular disease ($n = 7$), tumor ($n = 4$), angiodysplasia ($n = 2$), trauma ($n = 2$), anastomotic leakage ($n = 2$), arteriovenous fistula ($n = 1$), colitis ($n = 1$), and pseudoaneurysm ($n = 1$). During the time period we reviewed, 51 additional negative angiographic studies were performed for suspected LGI bleeding. None of our patients who underwent angiography for active LGI tract bleeding underwent surgery instead of superselective embolotherapy as the first-line treatment. The mean volume of packed red blood cells before embolotherapy was 6 U per patient (range, 0–20 U). All patients were examined and treated as part of routine care and gave informed consent. After obtaining informed consent, patient data were prospectively collected and retrospectively analyzed. The local institutional review board gave approval for this study.

Angiographic and Interventional Technique

With all 20 patients under local anesthesia, we performed digital subtraction angiography via a common femoral artery approach by using a 5-F vascular sheath (Terumo, Tokyo, Japan). All embolizations were carried out in our angiography suite. A Cobra- or Sidewinder-shaped catheter (4–5-F C-2 or VS-2 catheter; Cook, Bloomington, Indiana) was used for selective catheterization of the superior and inferior mesenteric arteries to locate the souce of bleeding. Diagnostic catheter maneuvers were usually performed with a steerable 0.035-inch guide wire (Radifocus; Terumo). In none of our patients was provocative mesenteric angiography used or considered.

Once a bleeding source had been verified, all patients underwent superselective TAE with a coaxially placed 2.7- or 3-F microcatheter (Progreat, Terumo; Fast Tracker, Target Therapeutics, Fremont, California) (**Figs 1–4**). For TAE, fibered 0.018-inch platinum microcoils (VortX; Boston Scientific, Natick, Massachusetts) with a nominal configured diameter of 2 × 3 mm, 2 × 4 mm, and 2 × 5 mm and a stretched length of 22–42 mm were used in 16 patients. Polyvinyl alcohol (PVA) particles (150–300 μm and 350–500 μm; Contour, Boston Scientific) reconstituted with 20 mL of contrast medium per vial to guarantee adequate visualization and suspended by agitated mixing between two syringes before injection, were used in two additional patients. Two patients underwent embolization with a combination of PVA particles and microcoils. In 16 of the 20 patients (80%), the microcatheter could be navigated close to the bleeding branch with the most distal point of TAE being the vasa recta. Because more distal catheterization had not been possible in four of the 20 patients (20%), the marginal artery was the preferred target of embolization in these cases. Transcatheter coil embolization was performed by means of an ultra-thin coil pusher wire (Coil Pusher; Boston Scientific) or, more frequently, saline injection. In general, embolic agents were selected on the basis of personal preference, catheter location, catheter size, and vessel size, as has previously been recommended (20). Superselective TAE ended with angiographic documentation of the absence of antegrade flow into the main feeding arteries. All embolization procedures were performed by four interventional radiologists with 6–20 years of experience with this kind of catheter therapy.

Follow-up

Peri- and postinterventional complications at the puncture site were documented in the first 24 hours. All 20 patients were assessed daily for clinical signs and symptoms of intestinal ischemia (abdominal pain and/or tenderness, peritoneal signs, nausea, diarrhea, fever) or recurrent LGI hemorrhage until discharge or death. These clinical findings were supplemented by laboratory studies (white