Safety and Efficacy of Transcatheter Arterial Embolization for Lower Gastrointestinal Bleeding: A Single-center Experience with 112 Patients

Saebeom Hur, MD, Hwan Jun Jae, MD, PhD, Myungsu Lee, MD, Hyo-Cheol Kim, MD, PhD, and Jin Wook Chung, MD, PhD

ABSTRACT

Purpose: To assess the safety and efficacy of transcatheter arterial embolization for lower gastrointestinal bleeding (LGIB) and to determine the prognostic factors that affect clinical outcome.

Materials and Methods: All patients diagnosed with LGIB by angiography at a single institution from April 2006 to January 2013 were included in a retrospective study. The rates of technical success, early recurrent bleeding, major complications, clinical success, and in-hospital mortality for transcatheter arterial embolization were determined. The influence of possible prognostic factors on the outcome was analyzed.

Results: A total of 112 patients were included (36 with small-bowel LGIB, 36 with colon LGIB, and 40 with rectal LGIB). N-butyl cyanoacrylate (NBCA) was the embolic agent for 84 patients (75.0%), whereas gelatin sponge pledgets (n = 20), microcoils (n = 2), polyvinyl alcohol particles with adjunctive gelatin sponge pledgets (n = 1), and blood clots (n = 1) were used in the other patients. The technical success rate was 96.4%. For the entire group, the rates of early recurrent bleeding, major complications, clinical success, and in-hospital mortality were 17.4%, 4.6%, 74.5%, and 25.0%, respectively. These were 15.2%, 4.8%, 75.3%, and 26.2%, respectively, in the NBCA group. Hematologic malignancy, immobilization status, and coagulopathy were significant prognostic factors for clinical outcomes.

Conclusions: Transcatheter arterial embolization is a safe and effective treatment for LGIB. NBCA could be used as a primary embolic agent for this procedure.

ABBREVIATIONS

LGIB = lower gastrointestinal bleeding, NBCA = n-butyl cyanoacrylate, OR = odds ratio

Lower gastrointestinal bleeding (LGIB) is defined as bleeding originating distal to the ligament of Treitz. It accounts for approximately 20% of all gastrointestinal hemorrhages, with an annual incidence of 35.7 per 100,000 persons in the United States [1,2]. Nonvariceal upper gastrointestinal bleeding is treated with transcatheter arterial embolization, which was accepted as a therapeutic method immediately after its development by Rosch and Dotter. In contrast, transcatheter arterial embolization for LGIB was abandoned until the mid-1990s in favor of vasopressin infusion as a result of an unacceptably high rate of bowel infarction associated with transcatheter arterial embolization [3,4]. However, the advent of superselective embolization with the use of a coaxial microcatheter system and various embolic agents reestablished transcatheter arterial embolization as the preferred method for the treatment of LGIB [4,5].

Various embolic agents are used for transcatheter arterial embolization of LGIB, including pledgets of absorbable gelatin sponge, polyvinyl alcohol or other spherical particulates, microcoils, and liquid embolic agents [6]. Among these, n-butyl cyanoacrylate (NBCA) has several advantages over the others because it can reach the most distal portions of the target artery for embolization regardless of the vessel caliber and can occlude the vessel without requiring a natural

coagulation process. The latter feature is especially useful in patients with coagulopathy, which is common in LGIB (7). Application of NBCA for transcatheter arterial embolization has been hindered by the complexity of handling the material and concerns about bowel infarction; nevertheless, two recent reports (8,9) indicated successful application of NBCA in the treatment of LGIB in a small number of patients.

The purpose of the present study was to assess the safety and the efficacy of transcatheter arterial embolization for LGIB and to determine the prognostic factors that affect clinical outcome.

MATERIALS AND METHODS

This study was approved by our hospital's institutional review board, and the informed consent requirement was waived for inclusion in this study. All patients with LGIB detected by diagnostic angiography at our institution from April 2006 to January 2013 were analyzed retrospectively. They had been referred for diagnostic angiography for suspicion of LGIB based on clinical symptoms, contrast-enhanced computed tomography (CT), or endoscopic findings. LGIB was defined as arterial hemorrhage into the lumen of the gastrointestinal tract distal to the ligament of Treitz. Positive angiographic findings for LGIB were (i) extravasation and pseudoaneurysm on the angiogram as definite signs of hemorrhage and (ii) vascular anomaly such as angiodysplasia or arteriovenous fistula or malformation as possible signs of hemorrhage. In the latter cases, the clinical diagnosis of LGIB was made after comprehensive consideration of the ancillary findings of symptoms, CT, or endoscopic examinations.

Analytic Items and Definitions

Electronic medical records were reviewed thoroughly to collect data regarding patient characteristics and details of the embolization procedure. Various etiologies for lower gastrointestinal hemorrhage identified on angiography included diverticular bleeding, gastrointestinal anastomosis bleeding, postendoscopic biopsy or mucosal resection bleeding, malignant tumor bleeding, and hemorrhage from vascular anomalies such as angiodysplasia or arteriovenous fistula or malformation. Patients were considered in an immobilized state when confined to bed by a neurologic disease such as a stroke, an orthopedic surgical disease such as femoral neck fracture, or any other condition that required an intensive care stay longer than 1 week. The diagnostic criteria for coagulopathy were (i) thrombocytopenia, defined as a platelet count of less than 80,000/mL; (ii) prothrombin time, defined as an International Normalized Ratio greater than 1.5; or (iii) activated partial thromboplastin time greater than 45 seconds.

Diagnostic Angiography and Embolization Technique

Emergency digital subtraction angiography and transcatheter arterial embolization were performed under local anesthesia by interventional radiologists. Arteriograms of suspected mesenteric arteries were obtained to identify the bleeding focus. Additional bilateral internal iliac angiography was performed for rectal bleeding. The bleeding branch identified on angiography or preprocedural CT was superselected with a microcatheter (Microferret; Cook, Bloomington, Indiana; or Progreat Alpha, Terumo, Tokyo, Japan). The microcatheter was advanced as close as possible to the bleeding focus. NBCA was chosen as the primary embolic agent if (i) angiographic findings confirmed hemorrhage, (ii) the microcatheter could be advanced close enough to the bleeding focus to limit the number of embolized vasa recta to fewer than three, and (iii) pericatheter flow could be restricted by wedging the microcatheter into the selected artery. If these conditions were not satisfied, alternative embolic agents were used, including gelatin sponge pledgets (Gelfoam; Upjohn, Kalamazoo, Michigan), polyvinyl alcohol particles (250–355 μm in size; Contour; Target Therapeutics/Boston Scientific, Natick, Massachusetts), microcoils, or autologous blood clots.

The NBCA was mixed with iodized oil (Lipiodol; Guerbet, Aulnay-sous-Bois, France) at ratios from 1:1 to 1:3 for radiopacity and to delay the polymerization time. A 5% dextrose solution was first infused through the microcatheter to remove any ions that could induce premature polymerization of the NBCA. The mixture was then injected by using a 1-mL syringe under continuous fluoroscopic monitoring to embolize the selected vessel. The injection speed was carefully controlled to prevent premature polymerization that might cause insufficient embolization and proximal overflow. Completion angiography was performed through the guiding catheter to check for persistent bleeding and the extent of embolization (Fig 1) (7). Additional selective embolizations for the lesion was performed if residual active bleeding was evident.

Technical and Clinical Endpoint

Technical success was defined as the disappearance of positive angiographic findings of hemorrhage on completion angiography (10). Cases with spontaneous cessation of bleeding as a result of arterial spasm during catheter navigation or with failure of superselection of the bleeding focus did not undergo transcatheter arterial embolization and were regarded as technical failures. Early recurrent bleeding was defined by clinical signs of recurrent LGIB requiring immediate medical, radiologic, endoscopic, or surgical treatment at the treated focus within 30 days of the embolization (11). Patients with technical failure of embolization or whose early recurrent bleeding could not be assessed as a result of early death or surgical resection