The Safety and Efficacy of Mesenteric Embolization in the Management of Acute Lower Gastrointestinal Hemorrhage

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Purpose: Mesenteric embolization is an integral part in the management of acute lower gastrointestinal (GI) bleeding. The aim of this study was to highlight our experience after adopting mesenteric embolization in the management of acute lower GI hemorrhage.

Methods: A retrospective review of all cases of mesenteric embolization for acute lower GI bleeding from October 2007 to August 2012 was performed.

Results: Twenty-seven patients with a median age of 73 years (range, 31 to 86 years) formed the study group. More than half (n = 16, 59.3%) of the patients were on either antiplatelet and/or anticoagulant therapy. The underlying etiology included diverticular disease (n = 9), neoplasms (n = 5) and postprocedural complications (n = 6). The colon was the most common bleeding site and was seen in 21 patients (left, 10; right, 11). The median hemoglobin prior to the embolization was 8.6 g/dL (6.1 to 12.6 g/dL). A 100% technical success rate with immediate cessation of hemorrhage at the end of the session was achieved. There were three clinical failures (11.1%) in our series. Two patients re-bled, and both underwent a successful repeat embolization. The only patient who developed an infarcted bowel following embolization underwent an emergency operation and died one week later. There were no factors that predicted clinical failure.

Conclusion: Mesenteric embolization for acute lower GI bleeding can be safely performed and is associated with a high clinical success rate in most patients. A repeat embolization can be considered in selected cases, but postembolization ischemia is associated with bad outcomes.

Keywords: Bleeding; Embolization; Lower; Gastrointestinal

INTRODUCTION

Lower gastrointestinal (GI) hemorrhage, defined as bleeding distal to the ligament of Treitz, is often self-limiting without any intervention. However, a small proportion of these patients will experience exsanguinating hemorrhage and require invasive procedures to control the bleeding [1, 2]. Whilst emergency surgery can often be curative, its morbidity and mortality are considerable [3, 4]. Colonoscopy is more often a diagnostic rather than a therapeutic modality [5, 6]. Over the past few decades, mesenteric angiography and embolization of the bleeding vessels have slowly been accepted as an integral part in the management of patients with acute lower GI hemorrhage [7-12]. Advancements in the technology and the equipment have enabled superselective embolization to be safely performed, and this has been associated with a decrease in the incidence of intestinal ischemia. However, concerns still exist about the safety and the effectiveness of this procedure within the medical community. We, therefore, performed this study to evaluate our institution's experience in the adoption of super-selective embolization as a primary therapeutic modality in the control of acute lower GI hemorrhage.

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METHODS

A retrospective review of the records of all patients who underwent a mesenteric embolization for acute lower GI hemorrhage from January 2007 to August 2012 was performed. This information was captured in a dedicated prospective database of interventional radiological procedures.

Our institution's protocols in the management of any patient with massive lower GI hemorrhage include active resuscitation with intravenous fluids and blood products if necessary. At the same time, it is imperative to determine the underlying site and etiology accounting for the hemorrhage. While most patients stop bleeding on conservative management, which includes ceasing their anticoagulation medications and the administration of blood products, a small group of patients continue to bleed actively. In these patients who are suspected of bleeding actively, the options include a diagnostic computed tomographic (CT) mesenteric angiography or an invasive mesenteric angiography straightaway with the view to embolize the bleeding vessels. This decision is made by the attending clinician. If active contrast extravasation is seen on the CT mesenteric angiographic scan, the patient would undergo an invasive mesenteric angiography with the view of embolization subsequently. It is not our institution's practice to perform a prophylactic embolization for bowel cancers or for bleeding that has been documented to be subacute or even chronic. Only patients who were actively bleeding massively were included in this study.

All patients gave their consent prior to the invasive procedure. The materials used for the embolization included microcoils, gelfoams, and polyvinyl alcohol particles. This was left to the discretion of the interventional radiologists. Some of the data collected included age, usage of antiplatelet or anticoagulant medications, and the preangiographic hemoglobin levels. The angiographic site of the bleeding and the underlying etiologies, together with the materials used for the embolization, were also documented. The quantity of blood products (packed red blood cells and fresh frozen plasma) given was also noted. Complications such as significant re-bleeding or ischemic bowel requiring surgery were also recorded.

RESULTS

A total of 27 patients underwent mesenteric embolization for their acute lower GI hemorrhages. The median age of the study group was 73 years (range, 31 to 86 years). More than half (n = 16, 59.3%) of the patients were on antiplatelet and/or anticoagulant therapy (Table 1). There were 5 patients who were on two blood-thinning agents. The median hemoglobin prior to the embolization was 8.6 g/dL (6.1 to 12.6 g/dL).

All mesenteric embolization procedures were performed within 24 hours of the bleeding episodes. The materials used for the embolization included coils (n = 14), gelfoams (n = 9), and particles

Table 1. Demographics of the 27 patients who underwent mesenteric embolization for lower gastrointestinal hemorrhage

Variable	Value
Age (yr)	73 (31–86)
No. of patients on anticoagulationand/or antiplatelet therapy	16 (59.3)
Site of hemorrhage (n = 33)	
Right colon	11 (40.7)
Left colon and rectum	10 (37.0)
Small bowel	6 (22.2)
Underlying etiology for hemorrhage (n = 33)	
Diverticular disease	9 (33.3)
Postsurgical hemorrhage	6 (22.2)
Neoplasm	5 (18.5)
Ulcer	4 (14.8
Likely angiodysplasia	3 (11.1)
Hemoglobin before invasive mesenteric angiography (g/L)	86 (61–126)
Amount of packed red blood cells transfused (unit)	8 (2–20)
Amount of fresh frozen plasma transfused (unit)	4 (0–10)

Values are presented as median (range) or number (%).

(n = 8). Seven patients had a combination of the above agents administered. The underlying etiology included diverticular disease (n = 9), neoplasm (n = 5), and postprocedural complications (n = 6). The colon was the most common bleeding site (21 patients: left, 10; right, 11) while the remaining 6 patients had bleeding arising from the small bowel.

In the six patients who required embolization for postprocedural complications, one was due to uncontrolled hemorrhage following a polypectomy in the right colon. This bleeding did not stop in spite of endoscopic interventions and necessitated immediate embolization. Two other patients had bleeding arising from the stapled line following a right colectomy when they presented with persistent per rectal bleeding following their emergency surgeries. One patient had bleeding arising from the transected mesentery after a bowel resection. Two other patients developed abnormal aneurysms of their visceral vessels after their earlier surgeries and bled considerably as well.

In the 6 patients who were embolized for small bowel pathology. Two were for neoplastic pathologies. One was from a GI stromal tumor and had a successful small bowel resection after a successful embolization. Another was an adenocarcinoma of the small bowel. Unfortunately, the tumor was not resected even after the embolization as it was rather advanced, and the patient had metastatic disease at diagnosis. Two patients bled from ulcerations. These were subsequently confirmed on enteroscopy in the same admission after the bleeding had ceased. The last two patients bled from abnormal vasculature in the small bowel, likely from angiodysplasia.

There were three other patients who bled from neoplastic etiologies. Two had active contrast extravasation from their newly diag-

Table 2. Outcomes of the 27 patients following embolization

Variable	Value
Materials used for embolization	
Microcoils	16 (59.3)
Gelfoam	9 (33.3)
Particles	9 (33.3)
No. of failures	3 (11.1)
Rebleeding requiring reembolization	2 (66.7)[a]
Ischemic bowel requiring emergency surgery	1 (33.3)[b]

Values are presented as number (%).
[a]Advanced pancreatic neoplasm and right colonic diverticulosis. [b]Infarcted sigmoid colon.

nosed rectal cancers. Both underwent successful surgery after further optimization of their condition following the successful embolization. The last patient had an advanced pancreatic neoplasm that had invaded the splenic flexure. Despite a successful embolization attempt, it re-bled again 1 month later, and an extensive surgery comprising a subtotal colectomy, distal pancreatectomy, and gastrectomy with splenectomy was performed several days after stabilization of the patient's conditions.

The median quantities of packed red cells and fresh-frozen plasma infused were 8 units (2 to 20 units) and 4 units (0 to 10 units), respectively. There were 3 failures (11.1%) in our series (Table 2). One was the patient with an advanced pancreatic neoplasm described earlier who underwent a successful repeat embolization before surgery. Another patient with right-sided diverticulosis rebled 3 days after the initial successful embolization. He was eventually discharged well. The only mortality from our series was a patient who suffered an ischaemic bowel following the embolization. This was an 83-year-old patient who presented with massive hematochezia and subsequently underwent embolization of her bleeding sigmoid vessels arising from her diverticular disease. Three days after the procedure, she developed abdominal pain with rising white cell counts. A CT scan of the abdomen was performed, and some nonspecific stranding and a small amount of ascites were described. She was observed overnight and when her symptoms worsened the following day, she was brought to the operating theater for an infracted colon. Intraoperatively, the sigmoid colon and the descending colon had infracted and perforated. There was fecal peritonitis. A Hartmann procedure was performed, and she was transferred to the intensive care unit for further resuscitation. She continued to fare badly and developed multiorgan failure; she died 8 days following the operation.

DISCUSSION

Our series supported the growing number of publications highlighting the safety and the efficacy of superselective embolization in the treatment of acute lower GI hemorrhage. The present study has a clinical success rate of 88.9%, and two of the three failures

were successfully reembolized. Although the risk of ischemia has decreased considerably with better embolization techniques, the only ischemic complication reported in our series required immediate surgical intervention and was the only mortality. The poor outcome following surgery was not unexpected and has been reported previously [8]. This included a recommendation to avoid any primary anastomosis in patients who were operated on for complications following embolization because of the questionable vascularity of the remaining bowel [8].

The fact that a significant proportion of our patients were successfully embolized despite being on antiplatelet or anticoagulation therapy was very encouraging. The number of these patients will continue to rise with a greying population, which is itself associated with numerous cardiac and vascular conditions that require these medications. Stopping these medications while the patient is bleeding makes perfect sense, but the timing to restart the medications when the bleeding has ceased should be evaluated weighing the risks of rebleeding against the dangers of developing complications from the patients' underlying cardiac or vascular conditions [13-15].

Perhaps more noteworthy was that we were able to successfully embolize patients who had active bleeding from neoplastic pathologies. Whilst some may argue that surgical extirpation of these underlying pathologies would be definitive, any emergency operation in the setting of active hemorrhage is associated with considerable risks. In our opinion, the benefits of embolization are twofold. Stopping the acute bleeding enables the patient to be optimized and counseled appropriately before the definitive surgery. On the other hand, if the patient has unresectable disease, then embolization can be a palliative procedure.

Bleeding is one of the complications following any invasive procedure. Our study demonstrated the technical safety and feasibility of superselective embolization in stopping acute bleeding episodes. Unfortunately, we believe that clinicians and surgeons are still rather apprehensive about adopting this technique in the management of postprocedural complications as surgery is still deemed the gold standard and this indication for mesenteric embolization has not been frequently highlighted in the literature.

However, mesenteric angiography itself is not without its own sets of complications. The considerable amount of intravascular contrast used is not without its risks [16, 17]. Hematoma, pseudoaneurysms and stenosis of the femoral artery following the puncture can lead to significant morbidity as well. This is the reason CT mesenteric angiographic scans have replaced invasive mesenteric angiography as the diagnostic modality of choice to verify and determine the exact bleeding site prior to the invasive angiography [18-20]. Currently, CT mesenteric angiography has become the standard diagnostic modality in our institution for patients who are actively bleeding in whom a lower GI etiology is suspected. An invasive mesenteric angiography and possible embolization would only be performed if active contrast extravasation was identified. Unfortunately, there have been instances in which the bleeding has

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stopped by the time the invasive angiography was performed following a positive CT scan. Whether the time taken from the performance of the CT scan to the time of the invasive angiography plays a significant role merits further work.

There were several limitations in our current study. Its retrospective nature may have significant concomitant drawbacks. Clinicians' preferences and an absence of institutional guidelines in the management of patients with acute lower GI bleeding are huge selection biases. The small number of patients in our series limits the ability to conduct any useful statistical analysis. Besides, the varied and low number of complications would make such an analysis unhelpful.

In conclusion, mesenteric embolization for acute lower GI bleeding can be safely performed and is associated with a high clinical success rate in most patients. A repeat embolization can be considered in selected cases, but postembolization ischemia is associated with bad outcomes.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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