

Lower gastrointestinal bleeding treated with transcatheter arterial embolization

Case report and review of the literature



Ann. Ital. Chir., 2008; 79: 281-286

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Lower gastrointestinal bleeding treated with transcatheter arterial embolization: case report and review of the literature

Acute lower gastrointestinal bleeding, is often a dramatic situation, associated with mortality rate up to 28%. Currently transcatheter alternatives have found their place in the therapeutic spectrum of this situation. An interesting question is when should this procedure be performed and which are the difficulties when performing it.

We present the case of a 75-year old woman with acute massive lower gastrointestinal bleeding on the tenth post-operative day of a colic and partial ileal resection. Superselective angiography of the superior mesenteric artery was obtained that disclosed marked contrast extravasation of distal branches of the left colic artery as well as from a small branch feeding the distal enteric anastomoses. Clinical success was achieved after superselective embolization which was accomplished by using polyvinyl alcohol particles. The patient was discharged 5 days later and there were no procedure-related complications during 6-month follow-up period. So, especially in post-operative patients who are considered to be poor candidates for surgical treatment, arterial embolotherapy should be established not only as treatment option, but also as first line therapy for LGI bleeding.

KEY WORDS: Bleeding, Embolization, Lower Gastrointestinal (LGI), Polyvinyl alcohol particles (PVA).

Introduction

The incidence of postoperative hemorrhage after abdominal surgery has been reported to be from 2% to 18%.¹⁻⁷. Recently the mortality of post operative hemorrhage was decreased, but it is still a serious and life threatening condition associated with high mortality rate up to 28%. Early diagnosis and prompt treatment are both therefore necessary to improve the prognosis of the condition¹⁻⁷.

Postoperative abdominal bleeding is possible related to the operative anastomoses sites and to the medium -to- small sized arteries of the gastrointestinal system, that are not noticeable under emergency surgical conditions⁸.

Selective arterial embolization has been found to be effective in controlling such bleeding, which otherwise would not be controlled by medical treatment. The major risk of embolization for control of lower GI bleeding is irreversible intestinal ischemia⁹⁻¹⁶.

In addition there have been very few reports describing the efficacy of transarterial embolization in patients with postoperative LGI hemorrhage following abdominal surgery^{8,17}. The aim of this study is to evaluate the usefulness and safety of selective arterial embolization with polyvinyl alcohol particles, in the control of postopera-

Pervenuto in Redazione Aprile 2007. Accettato per la pubblicazione Gennaio 2008

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tive lower gastrointestinal bleeding, in a patient who had undergone multiple abdominal operations and was felt to be poor candidate for surgical treatment.

Case report

A 75-year old woman, was transferred to our department with acute lower gastrointestinal hemorrhage, 10 days after a total colectomy and partial abscission of the jejunum because of 3 cancerous localizations, 2 in the transverse colon and 1 in the caecum. Initially, endoscopy did not manage to identify the bleeding site and as the patient was a poor candidate for surgical treatment she was referred to our institution. On admission she was presented with signs of hypovolemia (systolic blood pressure <100mmHg, heart rate >100 beats/min). Fluid resuscitation was started immediately, through two large bore cannulae into peripheral vein and also she was transfused with two units of packed red cells in order to keep hemoglobin around 9mg. At the time of the procedure the patient was actively bleeding, so the two extravasation sites, probable sites of jejunal anastomosis, were demonstrated (Fig. 1). Left ileal artery was the feeding artery of the first extravasation, which was superselectively identified with a microcatheter that was placed as near as possible to extravasation site. (Fig. 2). A superselective catheterization of almost all ileal and jejunal arteries, as well as of the ileocolic artery was performed to identify the second bleeding site. This attempt was negative. The microcatheterization of a small aberrant vessel from the superior mesenteric trunk followed and finally the second bleeding site was visualized (Fig. 3). Post-embolization showed cessation of the active bleeding. The patient was discharged 5 days later and showed



Fig. 1: Demonstration of the extravasation in the feeding arteries of proximal and distal enteric anastomosis from selective catheterization of superior mesenteric artery.



Fig. 2: Appearance of the microcatheter at the bleeding site



Fig. 3: Demonstration of the second bleeding site.

no clinical signs of rebleeding or bowel ischemia during 6-months follow-up period.

Technique

A selective superior mesenteric angiography via femoral artery was performed, with use of digital subtraction imaging and selective arterial contrast injections with standard 5-Fr catheters, in order to detect the active bleeding site and also to provide a pathway for poten-



Fig. 4: Completion angiography demonstrating cessation of two active bleeding sites.

tial treatment. Once the bleeding site was identified, superselective catheterization was performed with the use of a 2.7 Fr (erumo, Tokyo, Japan) microcatheter inserted coaxially through the 5 Fr Cobra angiographic catheter with internal diameter of 0,038 (Terumo, Tokyo, Japan). A steerable 0.018-inch wire (Terumo, Tokyo, Japan) was used coaxially through the microcatheter to direct its selective positioning in the small distal branch arteries of the mesenteric tree. When superselective catheterization was successful, embolization was performed with Contour polyvinyl alcohol (PVA) particles (Boston Scientific, Cork, Ireland), which ranged in size from 45 to 155mm. PVA particles were suspended in 8 mL of low-osmolarity contrast material and 10 mL of normal saline per vial of PVA and were delivered through the microcatheter by means of a 3-mL syringe. Injections of the PVA were performed under direct fluoroscopic observation. Occlusion of the feeding vessel, stasis of the contrast material in the feeding vessel and reflux of contrast material into adjacent normal vessels were considered endpoints of embolization. Technical success was defined as immediate cessation of hemorrhage evaluated by completion angiography, which demonstrated that the bleeding site was blocked and that the remaining part of the bowel preserved its perfusion (Fig. 4).

Discussion

Acute lower gastrointestinal bleeding, hemorrhage originating below the ligament of Treitz, is often a

dramatic situation that, fortunately, can be managed conservatively in most cases^{18,19}. When medical and endoscopic management fails to equilibrate the patients hemodynamics, invasive treatment is required¹⁹. In such emergent settings, surgery with partial colectomy is associated with a perioperative mortality rate around 30%²⁰⁻²², typically ranging between 9%²³ and 47% among series, but sometimes up to 100%²⁴. Therefore, transcatheter alternatives have found their place in the therapeutic spectrum.

Colonic bleeding may arise from a variety of causes, but it is most common in the elderly due to acquired conditions: diverticular disease, neoplasia and angiodysplasia²⁵. Moreover, post operative gastrointestinal or intra-abdominal hemorrhage is not an uncommon complication after major abdominal surgery, particularly in the case of pancreaticoduodenectomy (2%-18%)¹⁷. Bleeding may occur early after abdominal surgery due to improperly ligated vessels in the operative area, or due to bleeding from the anastomotic site or the cut surface. Late bleeding is often due to a marginal ulcer or from an intra-abdominal source secondary to an anastomotic leak or localized infection¹⁻⁴. Early diagnosis and rapid treatment constitute life-savings procedures.

The traditional approach for the treatment for patients with post operative hemorrhage has been surgery. In the past, emergency surgery for high-risk patients with haemodynamic instability and poor general condition had a mortality rate as high as 64%²⁶⁻²⁷. Additionally, the surgical approach to the bleeding artery is often hazardous or even unsuccessful owing to the anatomical inaccessibility of these arteries and associated inflammatory reaction, especially in patients who have undergone multiple previous operations.

Consequently, in such cases transarterial embolization has been known to be very effective for post operative hemorrhages with low morbidity and mortality rates.^{8,28} However, there are very few studies in which the safety and efficacy of post operative embolization, in lower gastrointestinal bleeding, is evaluated. Bulakbasi et al⁸ described 10 patients with lower gastrointestinal bleeding following surgical treatment of multiorgan trauma, treated by selective embolization with a success rate of 90%. Likewise, Kim et al¹⁷ advocated the effectiveness of arterial embolization in 4 patients with lower gastrointestinal bleeding, who have formerly undergone major abdominal operations. Several embolic agents have been used to arrest lower gastrointestinal bleeding. Microcoils have become the agent of choice for many interventionalists.

They are highly radiopaque and they can more accurately be deployed²⁹⁻³². This is in contrast to PVA particles, which are not radiopaque but they can flow to the bleeding site and occlude numerous vessels from a single injection. In our case the choice of PVA was

based on the desire to produce more permanent vascular occlusion, as well as on the compatibility of particulate agents with the small diameter catheters.

Despite the increased risk of ischemia from distal embolization, evidence shows that particles 100µm or larger may be injected from a proximal site and produce minimal or no change in the involved intestinal distribution^{15,33}. In order to minimize the risk for a potential complication we used the minimum number of particles necessary to achieve hemostasis in the target vessels.

The main complications of mesenteric embolization are postembolic intestinal infarction in the short term and ischemic bowel strictures in the long term⁸. The increased risk of ischemia in the LGI tract, stems from a lack of abundant collateral vessels, particularly in the colon³⁴. The prevalence of postembolic intestinal infarction in reported series had ranged from 0%-20% with the collective rate approximating 15%^{13, 30, 32, 35, 36, 37}. According to Guy et al¹⁵ and Defreyne et al³⁸ who successfully treated 18 patients in total with PVA particles, we may assume that the risk of using the proper agent by skillful interventionalists, is not as high as it was thought to be. Additionally, other anatomic studies have demonstrated rich intramural networks and collaterals that preserve perfusion at the level of the colonic mucosa^{39, 40}. This may help to explain the decrease in ischemic complications after superselective embolotherapy.

The most important limitation of endovascular therapy is the inability to diagnose and treat patients, especially those who are not actively bleeding²⁵. There are several reasons why acute hemorrhage may not be detected by angiography: a) the rate of bleeding may be below a certain threshold and b) colonic bleeding is often intermittent in nature. We did not face such a problem since our patient was actively bleeding.

A further difficulty of embolization is technical failure in placing the coaxial catheter sufficiently distal enough to allow the safe embolization of bleeding arteries. This occurs more often in post operative patients due to anatomical changes, caused, from the surgery. Technical failure has been reported to be 8%-21%^{9, 30, 32}. In our case although we had to treat with tortuous and atherosclerotic vessels, we managed to place the catheter proximal to the bleeding vessels and preserved the anastomotic plexus, without causing any ischemic damage to the gut wall.

Although recent literature had demonstrated that modern superselective embolization is a safe and effective treatment for LGI hemorrhage²⁹, these excellent results raise the question of whether embolization will replace or complement surgery in the management of GI bleeding.

Many surgeons argue that the time spent performing such treatments delays the time to definite surgery, which might lead to further instability and coagu-

lopathy and finally increased the associated with surgery morbidity⁴¹.

Conclusively, based on the literature which collectively shows a minimal risk of significant ischemic complication and a post embolic infarction rate of 0% in several studies, when a modern transcatheter technique is used, we believe that arterial embolotherapy should be established not only as a treatment option, but as a first line therapy as well for LGI bleeding, especially in post operative patients who are considered to be poor candidates for surgical treatment.

Riassunto

L'emorragia acuta del tratto inferiore del tubo digerente, è spesso una situazione drammatica, in quanto si associa ad una mortalità superiore al 28% . Attualmente , tecniche alternative utilizzando la radiologia interventistica hanno trovato il loro posto nelle scelte terapeutiche di queste situazioni. Una questione davvero interessante è la definizione di quando è possibile utilizzare tale procedura, ed inoltre quali possono essere le difficoltà insorgenti durante la sua esecuzione. Nel nostro studio presentiamo il caso di una paziente 75enne che presentò una emorragia massiva ed acuta dal tratto inferiore del tubo digerente nella decima giornata del periodo post – operatorio di una colectomia con parziale resezione ileale. Eseguendo un'angiografia superselettiva dell'arteria mesenterica superiore venne messa in evidenza una significativa fuoriuscita di sangue a livello delle diramazioni distali dell'arteria colica di sinistra come pure da un breve ramo vascolare provvedente all'apporto di sangue alle anastomosi enteriche distali. La terapia fu effettuata con una embolizzazione superselettiva dei vasi sanguinanti usando delle particelle di alcool polivinilico.

La paziente venne dimessa 5 giorni dopo la procedura e nel periodo semestrale di follow-up dopo la sua dimissione non si sono verificate complicanze relative alla procedura. Risulta quindi evidente che l'emboloterapia arteriosa deve essere considerata non solo come una alternativa terapeutica, ma forse - specialmente in pazienti che nel postoperatorio sviluppano delle complicanze emorragiche ed hanno limitata e riservata prognosi se trattati chirurgicamente – il trattamento d'elezione per le emorragie acute dal tratto gastrointestinale inferiore .

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