

Transarterial Embolization of Nonvariceal Gastrointestinal Bleeding: Our Experience

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ABSTRACT

Objective: To analyze the technical and clinical outcomes of transarterial embolization in patients with nonvariceal gastrointestinal (GI) bleeding in our institute. **Materials and Methods:** From July 2009 to June 2013, retrospective data of all patients with nonvariceal GI bleeding who underwent catheter-directed angiography with or without Transarterial Embolization (TAE) were collected and included in the study. All were inpatients at the time of the procedures, and they were followed up till discharge or demise. **Results:** Out of 152 patients, 127 cases (age - 12–94 years; median age – 47 years) of GI bleeding were included in the study. Male to female ratio was ~4:1. Catheter-directed angiography was tried in all 127 patients. Out of 37 patients (29%) who had a normal angiogram, 26 (70%) improved spontaneously without embolization whereas in 11 (30%) the bleeding source could not be identified even with a repeat angiogram and clinical evidence of haemorrhage requiring surgery. Out of 90 patients (71%) with angiographically visible bleeding; 88 (69.3%) had successful, catheter directed trans-arterial embolization (TAE) whereas in 2 patients (2.2%), the bleeding vessel could not be cannulated (technical failure). Complications were encountered in 11 patients (8.7%) and rebleeding occurred in 3 patients (3.4%). Angiography related mortality was 4.7% (6/127). **Conclusion:** Endovascular treatment can be performed safely in sick patients. It is technically demanding, and it is not always possible for anatomic reasons or because of distorted anatomy due to previous surgeries.

Key words: Angiography; endovascular; gastrointestinal bleeding; microcoils; trans-arterial embolization

Introduction

Gastrointestinal (GI) bleeding is a common clinical condition and frequently requires hospitalization and intervention, with significant morbidity and mortality, especially in the elderly. Whether an obscure site of bleeding is clinically evident or silent, it constitutes a diagnostic and therapeutic challenge for the clinician.^[1,2] There are multiple imaging modalities and therapeutic interventions that are currently being used in the evaluation and treatment of acute GI hemorrhage; each with its strengths and weaknesses. The ultimate objective is to localize, characterize, and when indicated, treat the bleeding lesions.^[2] Computed tomography (CT) angiography

is usually used for the initial evaluation of patients, but catheter-directed angiography is more likely to demonstrate an exact location of the bleeding and treat if the rate of bleed is >0.5 ml/min.^[1] In addition, it can allow identification of nonbleeding lesions (e.g., vascular ectasias, tumors, and inflammatory lesions) on the basis of their vascular patterns.

Nowadays, catheter-directed trans-arterial embolization (TAE) is the first-line therapy for the management of GI bleeding that is refractory to endoscopic hemostasis, especially in critically ill patients.^[1,2] Our goal is to review our

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experience with transarterial management of nonvariceal GI bleeding in our clinical setting.

Materials and Methods

It is a descriptive study. The retrospective data of all patients referred to us from July 2009 to June 2013 with obscure GI bleeding were collected. All patients who underwent CT-angiography or catheter-directed angiography or both with or without transarterial embolization were included in the study. Patients with insufficient records were excluded from the study. All were inpatients at the time of the procedures, and they were followed up till discharge or demise in the same hospital admission. Patient's data were reviewed from hospital files/electronic records. All studies were performed in the interventional radiology unit. The main indication of TAE was either obscure nonvariceal bleeding or bleeding not controlled by endoscopic/colonoscopic procedures.

The variables studied and reviewed were the demographic parameters of patients, underlying cause of bleeding, associated comorbid conditions, and findings of diagnostic/therapeutic CT/visceral angiography. We reviewed the results and findings of TAE in patients having clinical evidence of bleeding (falling hematocrit) in the form of clinical and technical success rates. Periprocedural problems, complications, and procedure-related morbidity and mortality were also reviewed from retrospective data.

At our institute, we perform detailed imaging workup and subsequent endovascular management in all patients with clinical evidence of recurrent GI hemorrhage without a definitely identified source when requested by the primary clinical/surgical team, if required. Most of the patients referred to us for endovascular management are those who have already been evaluated endoscopically. Surgery is generally reserved for patients in whom the source of hemorrhage could not be definitively treated by endovascular means. Patients with persistently negative study may undergo continued observation and conservative management and if required, repeated diagnostic studies. In all patients in this study, we did not use any invasive agents to visualize the bleeding vessel. Technical success defined as angiographic cessation of bleeding after TAE, whereas clinical success was defined as cessation of bleeding in post-TAE period in the same hospital admission.

Catheter-directed angiography and embolization were performed in a standard manner under fluoroscopy (DSA Suites: [XRADVANTX LCA (GE Healthcare, UK) and ALLURA XPER FD20 (Philips Healthcare Andover, Massachusetts, USA)]). All procedures were performed via a common femoral artery access by a 5-F catheter-based system. Diagnostic angiography of the celiac artery, superior mesenteric artery (SMA), and inferior mesenteric artery was initially performed. The primary vessel and distribution of suspicion

were first determined, based on the result of clinical evidence, endoscopic, and radiologic examinations. We used Brilliance CT 64-channel scanner with essence technology (Philips Medical Systems, The Netherlands) as a screening modality in patients without a definitively diagnosed source of active GI bleeding. Usually, we choose SMA, as the primary artery of suspicion. We routinely preferred microcoils (Cook, Bloomington; USA) for transarterial embolization, but in few cases, Lipiodol, Glue (n-butyl cyanoacrylate), stents, or its combinations were used.

Results

From July 2009 to June 2013, the diagnostic/therapeutic angiography was performed in 152 patients. Twenty-five patients were excluded from the study because of insufficient records and 127 patients (aged - 12-94 years; median age - 47 years) were included in the study. 25 (19.7%) patients were female (M: F ~ 4:1). There were 79 associated comorbid conditions found in 42 patients [Table 1]. Catheter-directed angiography was performed in all 127 patients. 37 (29%) patients showed normal angiogram without extravasations of dye or evidence of bleeding, in which 26 (70%) improved spontaneously without embolization whereas in 11 (30%) the bleeding source could not be identified even with a repeat angiogram and clinical evidence of haemorrhage. All these 11 patients had a history of single or multiple previous surgeries and needed surgery for an obscure source of bleed.

Out of 90 patients (71%) with angiographically visible bleeding catheter-directed transarterial embolization (TAE) was successfully performed in 88 patients (97.8%), Whereas in 2 patients (2.2%), we localized the bleeding vessel but failed to cannulate it due to technical reasons (technical failure). The Gastroduodenal artery and its branches followed by the right hepatic artery and its branches were the leading vessels responsible for bleeding [Table 2]. In the TAE group ($n = 90$), the initial technical and clinical success rates were 97.8% (88/90) and 100% (88/88), respectively.

Table 1: Associated comorbid conditions in patients ($n=42$)

Comorbidity	Number of patients
Coagulopathy	11
Hypertension	21
Diabetes	18
MODS	3
ARDS/COPD	4
Renal disease	8
Coronary artery disease	9
Postpartum sepsis	1
Thyroid/parathyroid disorder	2
Tuberculosis	2
Total	79 in total 42 patients

MODS – Multiorgan dysfunction syndrome; ARDS – Acute respiratory distress syndrome; COPD – Chronic obstructive pulmonary diseases

But later, rebleeding occurred in 3/88 (3.4%) patients after 24–48 h of successful angiographic embolization. In one patient, it was controlled by re-embolization, whereas two patients needed surgery (bowel ischemia occurred in one patient after re-embolization). Overall, 86/88 (97.7%) patients were clinically stabilized after transarterial angiographic embolization (clinical success rate - 97.7%).

Complications encountered after transarterial angiography in 11/127 (8.7%) patients included bowel ischemia required surgery, common hepatic artery dissection, and splenic abscess [Table 3]. There was no procedure-related mortality. A total of 13/127 (10.2%) patients (11 with normal angiogram but with clinical evidence of bleed, one with recurrent bleed, and another with bowel ischemia after re-embolization) needed surgery after visceral angiography [Table 4]. Six patients (4.7%; $n = 127$) expired during their hospital admission period. One out of six expired patients had normal repeated angiogram, whereas in two patients, we could not cannulate the bleeding vessels. These three expired patients were critically ill with multiple organ dysfunction syndromes (MODSs). One expired patient had severe heart disease with diabetes mellitus and hypertension, whereas two patients expired due to their underlying malignancy.

CT-angiography was performed in 43% (55/127) patients. CT-angiographic findings coincide with visceral angiographic findings in 54 patients, whereas in one patient, visceral angiography localized the bleeding source but was not detected CT-angiography.

Discussion

TAE was introduced by Rösch *et al.*^[3] in 1972, and nowadays is used as first-line treatment for acute nonvariceal GI bleeding not controlled by endoscopic therapy. It is preferred over surgery, especially in high-risk patients.^[3-6] The evaluation and treatment of acute GI bleeding are complex and often require a multispecialty approach.

In approximately, 75% of cases of upper GI bleeding and 80% of cases of lower GI bleeding; the bleeding will cease spontaneously with supportive measures alone; in the remaining 20–25% of cases, further intervention is required.^[2,7] Kim *et al.* reported that because of the intermittent nature of most GI bleeding, 52% patients with acute upper and lower GI bleeding had a normal angiogram.^[8] It was seen that hemodynamically stable patients or patients with lower GI bleeding have significantly higher incidence of angiographically negative outcome.^[9-11] We also observed this finding in our study and about 70% (26/37) of patients with evidence of bleeding, but normal angiogram experienced spontaneous resolution of their condition without rebleeding after angiography.

CT-angiography is now the first-line investigation of choice, and catheter-directed angiography is used as a prelude to

Table 2: Artery responsible for bleeding ($n=90$)

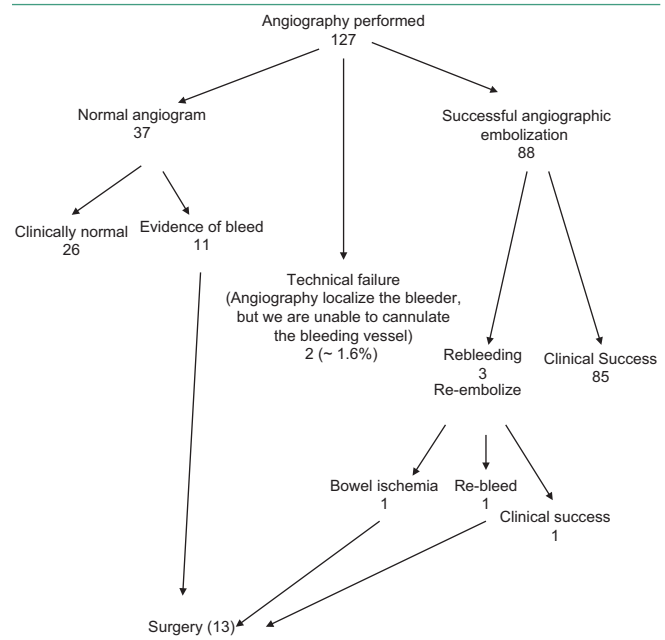
Co-morbidity	Number of patients
Common hepatic artery	9
Right hepatic artery and its branches	15
Left hepatic artery and its branches	8
Splenic artery and its branches	9
Gastroduodenal artery and its branches	21
Superior mesenteric artery and its branches	8
Inferior mesenteric artery and its branches	6
Right and Left gastric artery and its branches	6
Others	8
Total	90

Table 3: Periprocedural (transarterial angiography) complications ($n=11$)

Complications	Number of patients
Bowel ischemia	1
CHA dissection	1
Splenic abscess	1
Migration of coil	1
Hypotension/hypothermia/metabolic acidosis	5
Contrast reaction	2
Total	11

CHA – Common hepatic artery

Table 4: Flow chart of the result



intervention.^[12] Embolization of the bleeding vessel is the mainstay of transcatheter treatment for nonvariceal GI bleeding, and high technical success rates (angiographic cessation of bleeding) of 91–100% have been reported.^[12-14] Clinical success rates (cessation of bleeding for 30 days) of 68–82.5% for upper GI bleeding and 81–91% for lower GI bleeding have been

reported.^[12-14] We achieved the technical and clinical success rates of 97.8% (88/90) and 97.7% (86/88), respectively, in our series.

Major reported factors associated with rebleeding are coagulopathy, longer time to angiography, massive transfusion, previous surgery, multiorgan system failure, bleeding secondary to trauma, invasive procedures, cancer bleeding (rather than noncancer bleeding), or use of coils as the only embolic agent.^[9,15-17] We realize that factors responsible for unfavorable outcome were older age with associated comorbidities, especially coagulopathy and coronary artery diseases; cirrhosis and malignancy, sepsis or severe illness with MODS, rebleeding after embolization, multiple attempts embolization, recent major surgery or multiple surgeries. Choice of embolic agent is a matter of debate. We usually prefer microcoils for embolization, but sometimes other agents were used successfully. We do not think that use of microcoils alone is associated with high rate of rebleeding. We had been used microcoils alone in more than fifty patients in our study and rebleeding was found in only three patients, that is not statistically significant. In one patient, after rebleed, we re-embolized him by cyanoacrylate glue, resulted in bowel ischemia and patient expired after surgery. We think that it happened because of less experience with glue embolization, and probably, we overembolized the vessels.

In this study, we observed that in 11 patients repeated angiography could not identify the bleeding source but they had evidence of bleeding. All these 11 patients had a history of single or multiple previous surgeries and finally needed surgery for an obscure source of bleed. Half of these patients were our early cases. We conclude that distorted anatomy due to previous surgeries and experience of intervention radiologist are other independent factors responsible for technical and clinical success of the procedure and overall outcome of the patient.

Overall survival is strongly correlated with clinical failure. Schenker *et al.*^[17] reported that patients with successful embolization had one-sixth of the mortality rate of those with a failed embolization regardless of their clinical condition.^[17] In our study, 2 out of 3 rebleeding patients expired after surgery. Coagulopathy, rescue surgery after a failed attempt for embolization, underlying medical problems such as cirrhosis and malignancy and multisystem organ failure are related with poor survival.^[9,11,17]

The current study has several limitations, mainly its retrospective design and shorter follow-up period.

Conclusion

Nonvariceal UGI bleeding remains an often serious clinical challenge. Catheter directed trans-arterial embolization (TAE) can be performed safely in most cases [Figures 1a and b, 2a-c and 3a-c] and it is an effective

treatment option for obscure nonvariceal GI bleeding in sick patients unresponsive to endoscopic treatment. It is

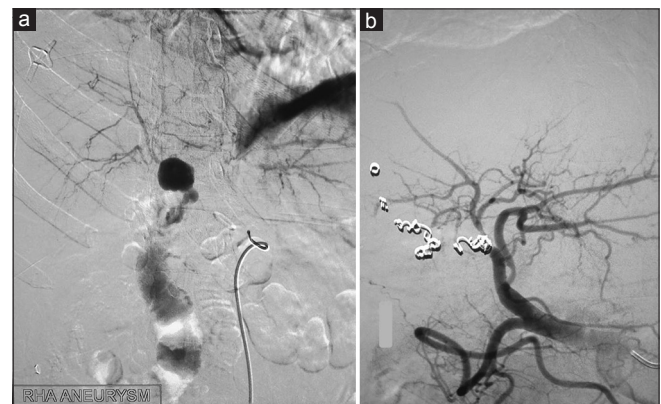


Figure 1: Right hepatic artery aneurysm (a) with active extravasations into duodenum, (b) postcoil embolization

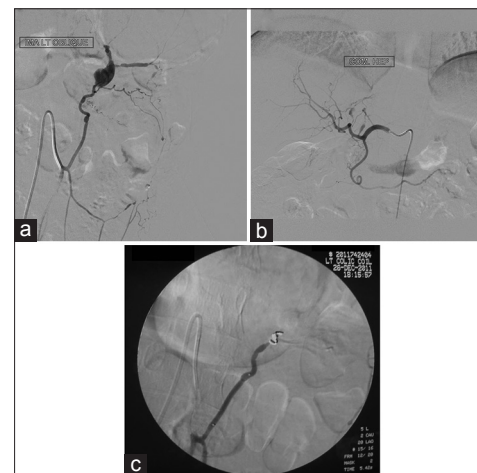


Figure 2: Multiple aneurysms in patients with rectal bleeding: (a) Left colic artery aneurysm pre-embolization, (b) common hepatic artery aneurysm for which patient was asymptomatic, (c) microcoils deployed in left colic artery aneurysm

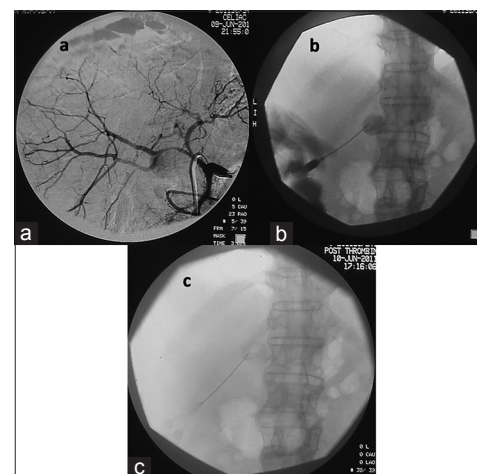


Figure 3: Right hepatic artery aneurysm (a) pre-embolization, (b) thrombin injection into aneurysm under combined sonographic and DSA guidance, (c) postthrombin injection image showing only residual contrast within aneurysm

technically demanding, and it is not always possible for anatomic reasons or because of distorted anatomy due to previous surgeries.

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Conflicts of interest

There are no conflicts of interest.

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