GEST 2016:
Case-Based Discussion: GI Bleeding of Arterial Origin

Presented by:
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• No relevant financial relationship reported
Case #1
Clinical Presentation

• 67yo Caucasian man with chest pain became hemodynamically unstable while hospitalized due to rectal bleeding
• Hemodynamic status was stabilized using vasopressors, fresh frozen plasma and blood transfusions.
• Nuclear scan showed bleeding from rectum and distal sigmoid colon
• Colonoscopy demonstrated acutely bleeding grade II-III internal hemorrhoid in the rectum 10cm from the anal verge
  • This was unable to be treated endoscopically due to severity of bleeding
Surgery was considered, but embolization was preferred because patient had responded to fluid resuscitation and had a coagulopathy that increased the surgical risk.
Selective right internal iliac Angiography

- The selective right internal iliac artery performed by an ipsilateral 4 Fr visceral selective catheter revealed:
Inferior mesenteric angiogram was negative. What’s next?
Left Internal Iliac angiogram was negative. What’s next?
Preembolization arteriogram LAO 32 degrees of the right internal iliac artery showing the extravasation site
Delayed preembolization arteriogram of the same right internal iliac artery showing the extravasation site.
Preembolization arteriogram of the same right internal iliac artery showing the extravasation site and the middle hemmorhoidal artery through RAO 50 degree projection.
Delayed preembolization right internal iliac arteriogram delayed phase in the RAO 42 degrees showing extravasation.

Post embolization selective right middle hemorrhoidal angiogram in the RAO 42 degree projection
Embolization and follow up

• Selective microcatheter embolization was performed using 355 to 500 micron PVA particles
• Patient had complete cessation of active rectal bleeding
• Over the next 4 days the patient Hgb stabilized and a total of 7 units of pRBCs was given during his hospital stay
• At 3.5 years post procedure he remained asymptomatic
Case 2
Clinical Presentation

• 75 year old male 2 day history of hematochezia up to seven times a day was admitted after a transrectal prostatic biopsy had been performed 7 days prior.

• He complained of lightheaded and one to two episodes of syncope on the day of admission. The patient complained of feeling too weak to stand up. He demonstrated orthostatic hypotension, and his hemoglobin level had dropped to 9.0.

• Patient was admitted to the ICU where he lost an additional 1500 cc of bright red blood per rectum. He was stabilized however with a transfusion of 4 units of packed red blood cells and fluid resuscitation.

• In addition, nuclear medicine bleeding scan was done to localize the bleed and possible intervention.
Nuclear medicine gastrointestinal bleeding scan. Arrow points to bleeding site from rectum.
Intervention

• IR was consulted by general surgery
• GI thought patient was bleeding too massively for endoscopic treatment
• Abdominal aortogram revealed a severely stenosed inferior mesenteric artery preventing selective catheterization
• The left internal iliac arteriogram demonstrated no extravasations of contrast to suggest active bleeding. Next, the right internal iliac artery was then selected using 4 French Simmons catheter
This is a right internal iliac arteriogram 30 degree RAO preembolization. Arrow points to middle hemorrhoidal artery. Arrowhead points to extravasation from site.
Superselective right middle hemorrhoidal arteriogram. Arrow points to extravasation site.

This is a right internal iliac arteriogram post embolization. Arrow points to right middle hemorrhoidal artery. Note lack of extravasation.
Embolization and follow up

• The vessel was then embolized using one vial of 355-500 μm polyvinyl alcohol particles with cessation of extravasations and slowing of flow within the right middle hemorrhoidal artery.

• The bleeding had stopped, however he required 2 more units packed red blood cells to stabilize his hemoglobin two days later despite no further indication of bleeding. The patient required total of 6 units of packed red blood cells transfusion.

• The patient has been followed up for last 1.5 years and is doing well.
Teaching Point

• Don’t forget the bilateral selective internal iliac angiogram for lower GI bleeding, especially rectal bleeding.


Case #3
Cases

93 yo male with bright red blood per rectum for 2 days with associated weakness, lightheadedness and abdominal discomfort. Hgb was 4.0 mg/dl on presentation. Nuclear medicine scan was obtained.
Selective SMA Angiogram
Angiogram is negative. What would you do next?
Superselective middle colic angiogram
No bleeding seen at splenic flexure
Superselective middle colic angiogram
Post embolization 500-700 micron Embospheres (0.25 vials)
Case 4

92yo lady who is having lower GI Bleeding
Nuclear medicine scan shows active bleeding from the Cecum.
Marker placed at the site of active bleeding during nuclear scan.
Case 2: Superselective iliocolic angiogram pre and post embolization 0.4 vial 500-700 micron embospheres
Results

• Patient stopped bleeding
• Patient developed transient ischemic colitis with abdominal pain that responded to conservative therapy.
• The patient was able to be discharged 7 days later.
<table>
<thead>
<tr>
<th>Patient #</th>
<th>Age/Sex</th>
<th>Hb Level on Presentation (g/dL)</th>
<th>Nuclear Medicine Source of Bleed</th>
<th>Angiographically Positive</th>
<th>Hemostasis after Embolization</th>
<th>Etiology of Bleed by Colonoscopy</th>
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<td>Yes</td>
<td>Diverticulosis</td>
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<td>Rectum</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
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<td>Yes</td>
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<td>Suspected diverticulosis</td>
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<td>10</td>
<td>85/F</td>
<td>10</td>
<td>Sigmoid colon</td>
<td>No</td>
<td>Yes</td>
<td>Diverticulosis</td>
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</tbody>
</table>
Empiric Embolization of Lower Gastric Hemorrhage Using Nuclear Medicine Bleeding Scan Localization

Presented at SIR 2016

Accurate localization of life threatening colonic hemorrhage during nuclear medicine bleeding scan as an aid to selective angiography.

Syed MI, Shaikh A.

Introduction

• Gastrointestinal hemorrhage is a life-threatening situation with up to a 10% mortality rate when emergent surgery is performed.

• Localization of the hemorrhage by a nuclear medicine scan is a useful first step for treatment with endoscopy, surgery, and/or by catheter directed embolization.

• Embolization has gained widespread acceptance for the treatment of upper gastrointestinal hemorrhage and more recently for lower gastrointestinal hemorrhage.
Limitations

• The limitation of angiography has always been the lack of the active bleeding during arteriography despite active bleed on the nuclear medicine scan.
  • In hemodynamically unstable patients, Ryan et al reported positive RBC scintigraphy with negative angiography in 31% of their patients (5 out of 16 patients).
  • Similarly, in a nonrandomized series; Burgess et al reported this scenario in 27% of their patients (4 out of 15 patients). [16]
  • In hemodynamically stable patients, Zink et al reported this scenario in 77.8% (14 out of 18 patients). [5] When vessels were embolized without the benefit of our technique as shown by Burgess et al there was an unfavorable outcome with two patients having proven ischemia and one having continued bleeding. [16]
  • Gillespie et al found that angiography was positive only 48% (40/83 episodes) of the time for lower gastrointestinal bleeding.

• This is a simple technique for localization of colonic bleed seen on the bleeding scan even if not visible with initial angiography that may guide superselective arteriography and empiric embolization.
Our Method

• A standard nuclear medicine scintigram is performed using Tc-99m tagged red blood cells.

• The site of bleeding is visualized and identified on the image monitor. While the patient is still under the gamma camera, a small 10 millimeter diameter cobalt-57 marker is placed directly on the patient's skin over the identified bleeding site (using the image monitor for guidance).

• The radioactive source should be placed immediately when extravasation is identified either during the early flow phase of the study or the subsequent five minute static images depending on rate of bleeding. The skin is then marked in this location using a permanent ink marker.

• A simple metallic marker is then used to localize the bleeding site on the patient's body.
Method (cont)

• A metal object (2 inch paper clip or EKG lead) is then placed over the localized bleeding site in order to identify the site during angiography. During the subsequent arteriogram the arterial supply to the bleeding site was easily localized if actively bleeding.

• However, when extravasations were not visualized on the arteriogram, the arterial supply was unique to the extravasations site and empiric embolization could be considered.
Accuracy of the Technique

Nuclear medicine scan
Bleed at splenic flexure

IMA angiogram early phase

IMA angiogram late phase
Note 1 vessel supplies this bleed
Accuracy of the technique

Nuclear medicine scan
Bleed at hepatic flexure

SMA angiogram late phase
Diverticular bleed and paperclip marker superimposed
Note 1-2 vessels supply this bleed
Empiric Embolization

• Superselection of the artery supplying the area of hemorrhage was performed using a 3-French microcatheter (Renegade, Boston Scientific, Natick, MA). This catheter was advanced coaxially to the bleeding site (marked by the clip) through the indwelling 4 or 5-French catheter. Attempts were made to position the catheter as close to the bleeding site as possible.

• Depending on the anatomy the catheter was either advanced through the superior mesenteric artery or inferior mesenteric artery distal branch (i.e. distal middle colic artery marginal artery).

• Embolization was then performed using 2.5–3.0 cc of 500–700 micron particles either Polyvinyl alcohol (Contour, Boston Scientific, Natick, Massachusetts, USA), Embospheres (Biosphere Medical, Rockland, Massachusetts, USA), or Bead Block Compressible Microspheres (Terumo Medical Systems (Tokyo, Japan)).

• 2.5-3.0 cc of particles were used for each branch whether the bleeding site was angiographically visible or not with the goal of occluding the distal branch of the artery (marginal artery and vasa rectal) close to the bleeding site.

• We know (based on previous experience with actively extravasating bleeding on angiography) that 2.5-3.0 cc of particles is sufficient enough to stop bleeding. In fact, 4.0cc is too much.

• MicroCoils are too targeted for this situation.
Advantages of this technique over MDCT angiography

- No iodinated contrast needed for nuclear medicine scan
- Nuclear medicine scan is more sensitive (0.2ml/min versus 0.3ml/min)
- Marker can be instantaneously superimposed over the patients body (during nuclear medicine scanning) by the technologist versus CTA (harder to do)
- CTA for bleeding protocol and/or interpreting radiologist may not be available in all settings
- In a community hospital such as ours the time delay between ordering the study and obtaining visible images/results is exactly 2 hours even on a weekend
Conclusions

• Colonic hemorrhage is a relatively common condition that may cause serious morbidity and mortality.

• A common dilemma that arises in management is the lack of active bleeding during arteriography despite active bleeding on nuclear medicine scan.

• The use of a metal marker during the nuclear scan can be used to guide superselective angiography, and allow for empiric embolization of the suspecting artery.

• This technique may offer an alternative to colorectal surgery in regular to high-risk patients suffering from massive bleeding and serve as a coordinated primary therapy between the gastroenterologist, interventional radiologist, and surgeon.
References


Notes

1. From what I understand, NM bleeding scan is generally done in patients that are "intermittently" bleeding. If CT can be performed, this is usually the test of choice unless the patient is in renal failure or has a contrast allergy. If the basis of our paper states that empiric embolization can prevent a patient from having to undergo surgery, this implies that the patients were already sick enough to be considered for surgery. Why did these patients even get a bleeding scan instead of a CTA (GI Bleed Protocol) or direct angiography if they were acutely unstable?

From article below Nuclear Medicine is still the most sensitive study, does not use contrast and is available in nearly every hospital. Also a nuclear scan can be diagnostic quickly if the patient is actively bleeding. Furthermore, you can pinpoint exactly where the patient is bleeding, which you cannot do readily with CTA (arterial phase is seconds so very difficult to pinpoint exact source of bleeding that you can use during angiography). As you know there are many elderly patients with Diabetes and renal insufficiency who are at high risk for renal failure due to contrast (even with normal creatinines). They are even more compromised when they are hypotensive and actively bleeding.
Notes

- I am currently on Nuclear Medicine now and when we interpret bleeding scans, it is generally imprecise. We are able to say what anatomic location, such as terminal ileum, hepatic flexure, sigmoid colon, etc is seen. If NM scans localize bleeding to the TI for example, and we place a metallic marker in this area, you as the interventionalist knows to select the SMA. However, how do you know which branch of the SMA to actually embolize? Is this strictly based on the location of the metallic marker?

- The colon is supplied arteriographically like spokes in a wheel. There are only 1 to 2 arteries that can supply a particular section of the colon that we localize with the marker. We know this because when we place a marker based on a nuclear scan and see active extravasation on the angiogram, the correlation is very precise. There is usually 1 arterial branch and at most 2 that we need to embolize if we are not sure.

- One more thing, because our patients are typically 80-90 year old frail patients, we only have one chance at bat to stop the bleeding. In private practice when many days I have over 20 procedures, I don't have time to have a negative angiogram sheath placement, hoping to treat them later when they are actively bleeding. The argument that many of these patients who have negative angiograms would have stopped bleeding anyways is hard to justify because we can't predict who is going to continue to bleed nonangiographically visibly. We therefore have to treat all comers who are actively bleeding on the nuclear scan. The alternative is surgery, which ends up with partial colon resection. This would be our worst complication if embolization was to create infarction. In other words the surgeons best outcome is our worst complication (so we have nothing to lose).
Case #5

Case provided courtesy of Hooman Khabiri, M.D.
Section Chief – Interventional Radiology
Ohio State University Medical Center / Wexner Center
Clinical presentation

• 71 yo male with a Hgb drop and abdominal pain status post Whipple procedure 17 days ago. Patient is bleeding from the JP Drain-site.
CTA shows 1.5 by 2.2 cm pseudoaneurysm supplied by the pancreaticoduodenal arcade. Gastroduodenal artery (GDA) has been ligated. There is high grade celiac artery stenosis at the origin and >50% narrowing of the SMA origin.

8/18/2014
Selective SMA injection

SMA Injection demonstrates a pseudoaneurysm in the region of the pancreatic postsurgical bed supplied by a collateral branch extending from the superior mesenteric artery to the proximal splenic artery.

Exhausted attempts were made using various combinations of catheters and wires in attempt to access the small tortuous collateral artery supplying the pseudoaneurysm without success. Of note, there is a high-grade stenosis of the celiac trunk.

Sos with micocatheter and wire
SIM 1 Catheter
C2 Catheter with Ansel 2 5F Sheath

All were attempted with no success.
The patient was sent back to the surgical team for consideration of surgical exploration, however, the surgical team decided that since the abdomen was very very hostile, that surgical repair of the pseudoaneurysm was impossible.
09/11/14
CT demonstrates persistent 3.1 x 2.4 cm pseudoaneurysm
Selective Celiac Angiogram
Selective SMA angiogram
09/12/2014
Pre and Post stenting angiograms of the SMA
Post covered stent angiogram
Note: subtle filling of the pseudoaneurysm
09/15/14
Selective celiac angiogram demonstrates no filling of pseudoaneurysm
Selective SMA angiogram demonstrates persistent filling of pseudoaneurysm from an SMA branch not excluded by covered stent
Multiple attempts to selectively catheterize the SMA branch supplying the pseudoaneurysm were unsuccessful. Procedure was aborted.
09/19/14
CT of the abdomen shows a pseudoaneurysm arising from a branch of the anterior aspect of the proximal splenic artery and a small branch arising from the superior mesenteric artery with its origin immediately distal to the covered stent. The pseudoaneurysm flow lumen is currently measuring 1.3 x 2.0 cm previously it measured 2.4 x 3.1 cm and is therefore smaller. The celiac artery is now nearly occluded at its origin. And the superior mesenteric artery shows a 60-70% ostial stenosis.
09/22/14
Angiogram showing filling of pseudoaneurysm via a branch of the splenic artery
SMA angiogram shows filling of the pseudoaneurysm from a branch of the SMA with retrograde filling of a branch to the proximal splenic artery.
Selective SMA angiogram
Microcatheter advanced through celiac access is able to reach the vessel feeding the pseudoaneurysm with great difficulty. However, advancing within this vessel beyond the origin of the pseudoaneurysm was not successful.
Another view showing filling of pseudoaneurysm
09/25/14
SMA angiogram clearly demonstrates filling of the pseudoaneurysm via a branch of the SMA which in turn anastomosis via collaterals into a retrograde filling branch of the proximal splenic artery

Any Ideas?
Celiac access attained by right radial approach
4mm PTA of celiac origin performed
Occlusion balloon within the SMA allows antegrade filling of the celiac artery which in turn promotes advancement of the microcatheter distal to the origin of the pseudoaneurysm to allow embolization proximally and distally to the origin of the pseudoaneurysm.
Successful coil embolization performed of the proximal splenic artery branch supplying the pseudoaneurysm. A total of two 4mm coils were placed.
Celiac angiogram reveals proximal splenic artery branch that was embolized.
Now What?  Any concerns?
6 x 27 mm stent deployed at Celiac artery origin
Since the major collateral to the celiac access from the SMA was embolized, it was necessary to stent the critical stenosis at the origin of the celiac artery.

All major collaterals between Celiac and SMA ligated during Whipple.
Stenting of the celiac origin using a 6mm diameter by 27mm balloon expandable stent was performed in order to establish antegrade flow into the celiac territory.
Now What? Any concerns?
Selective superior mesenteric angiogram reveals slow flow within the mesenteric artery as well as compression of the proximal SMA. The systolic pressure within the SMA was 31mm Hg, while the aortic systolic pressure was 97mm Hg.
SMA angiogram with sluggish flow in the SMA
SMA angiogram shows brisk flow following 8 x 27 mm balloon expandable stent deployment. Pressures between the aorta and SMA are now equal.
3d CT reveals proximity of SMA and celiac to explain compression of the SMA origin after proximal celiac stenting.
09/29/14
CT demonstrates no flow into the pseudoaneurysm. There is retained contrast within the pseudoaneurysm from previous procedures.

Patient continues to do well for 1.5 years now.
Teaching Points

• Brachial or Radial approach may be helpful when the groin approach is not successful.
• An occlusion balloon in the SMA may allow visualization of collateral branches from the celiac axis and vice-versa.
• Also, it may facilitate microcatheter advancement due to enhanced antegrade flow in the celiac artery.
• If you embolize the major collateral between the celiac and SMA and there is a critical stenosis in the celiac origin, stenting may be necessary.
• If there origins of the celiac and SMA are adjacent, stenting the celiac may create an iatrogenic stenosis in the SMA and vice-versa.
• Lastly, treatment of stenosis in these vessels may require a upper extremity approach.
• Always consider Image guided thrombin injection if endovascular embo fails
Image guided Thrombin Injection for Pancreaticoduodenal pseudoaneurysms

• Percutaneous thrombin embolization of a pancreaticoduodenal artery pseudoaneurysm after failing of the endovascular treatment