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LAVA Clinical Case Guide

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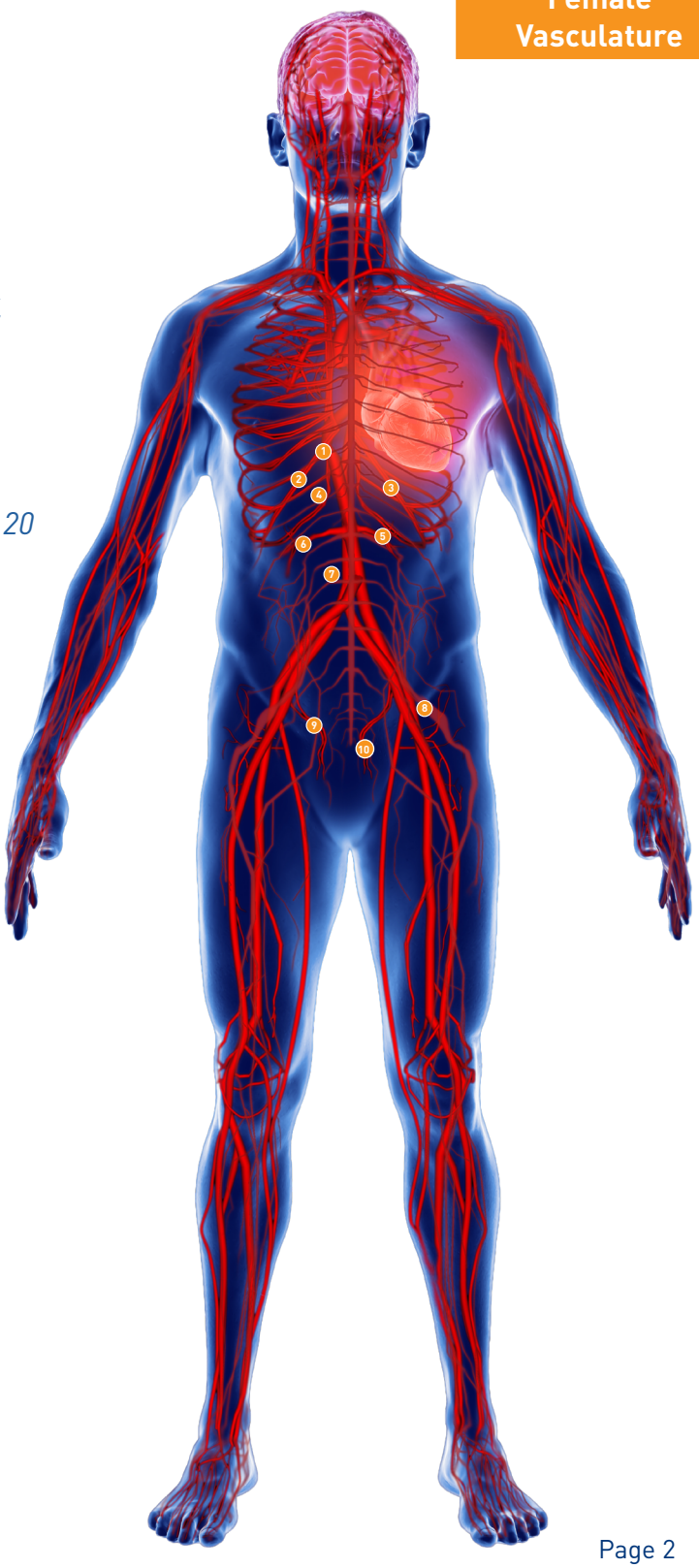


Right Inferior Phrenic - Trauma

Brian Imada, MD
Queens Medical Center
Honolulu, HI

Patient Presentation

68-year-old male s/p motorcycle accident, middle of the night. Patient critical. Coded on the table but stabilized immediately before treatment. Trauma doctors on site.

Pre-Embolization

Active extravasation observed off subsegmental branch of the right inferior phrenic artery (orange arrow).

Note the variant origin of the right inferior phrenic coming off the proximal renal artery.

Access & Treatment

Progreat 2.4, 130cm was advanced into the right phrenic artery.

Due to small size of the vessel and desire for LAVA to travel distal past the point of the bleed LAVA 18 was chosen.

Right Inferior Phrenic - Trauma (cont')

Brian Imada, MD
Queens Medical Center
Honolulu, HI

Post-Embolization

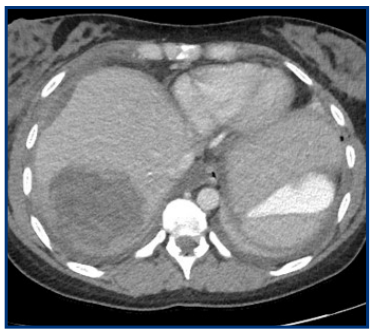
Total LAVA used was 0.1mL.

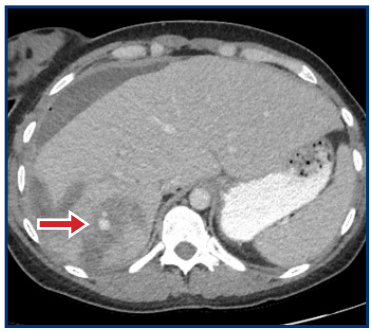
Patient's vitals immediately improved, specifically blood pressure.

No adverse events observed.

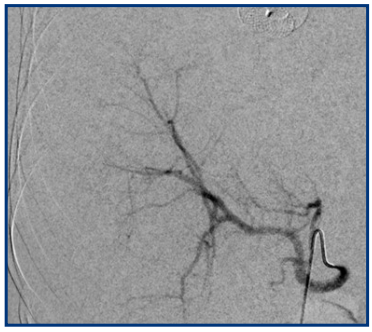
Liver Trauma - Hepatic Pseudoaneurysm

Chris Stark, MD
Albany Medical Center
Albany, NY



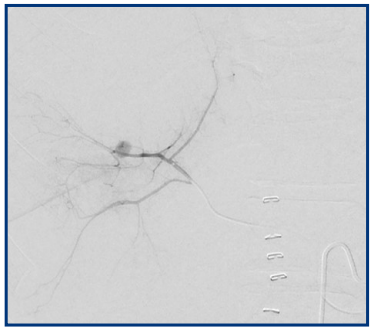
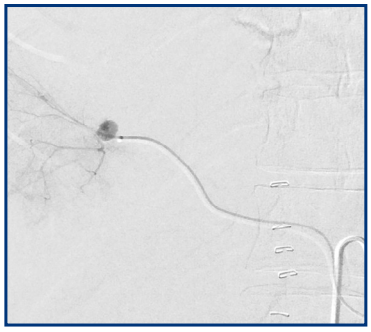



CT images through the liver demonstrate subcapsular and intrahepatic hematomas. Focus of enhancement centered within the right hepatic hematoma is suggestive of a pseudoaneurysm (red arrow).




Hepatic angiogram demonstrates a pseudoaneurysm arising from a branch of the right hepatic artery (red arrow).

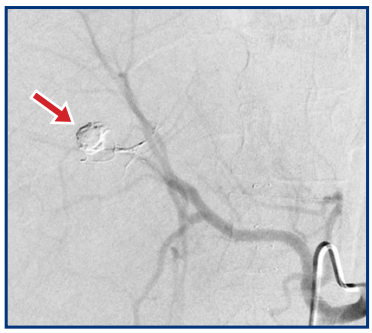
Access & Treatment

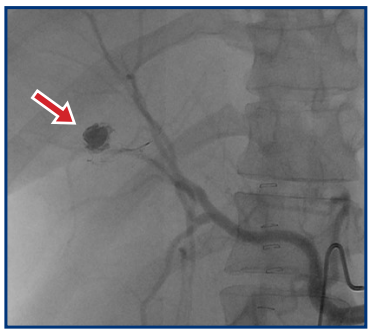



A microcatheter is advanced distally into the hepatic vasculature to the site of the pseudoaneurysm.

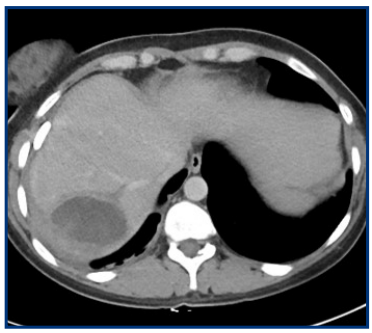
Liver Trauma - Hepatic Pseudoaneurysm (cont')

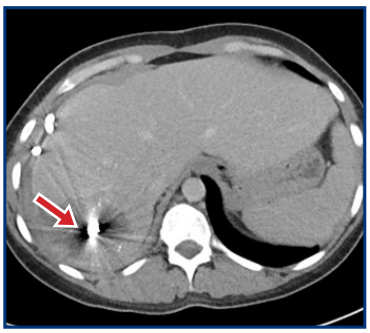
Chris Stark, MD
Albany Medical Center
Albany, NY

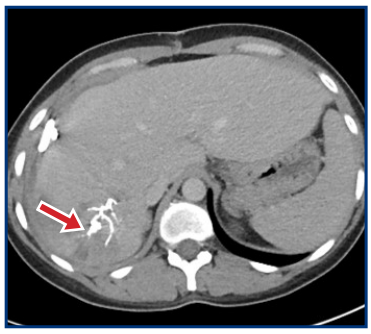




Embolization of the feeding vessel and pseudoaneurysm is performed with LAVA 18. Post-embolization angiogram with and without digital subtraction demonstrates the LAVA cast with complete occlusion of the pseudoaneurysm (red arrows).







Post-embolization CT scan performed two weeks later demonstrates the LAVA cast filling the pseudoaneurysm and adjacent vessels (red arrows). The intrahepatic hematoma has decreased in size. No adverse events.

Splenic - Trauma

Parag Patel, MD, FSIR
Froedtert Medical College of Wisconsin
Milwaukee, WI

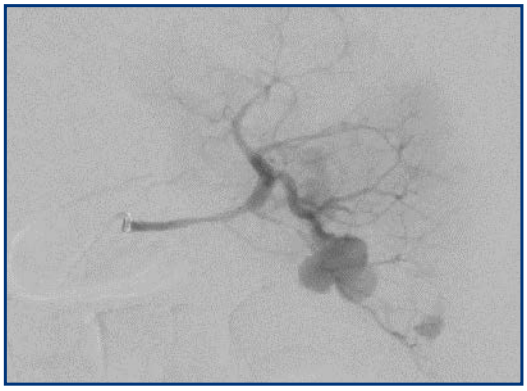
Patient Presentation

33-year-old male presented post motor vehicle collision. Multiple traumatic fractures and a grade 5 splenic laceration with extension into the splenic hilum, s/p massive transfusion protocol.

Imaging showed fractures of left acetabulum, left acromion and left open patella fracture.

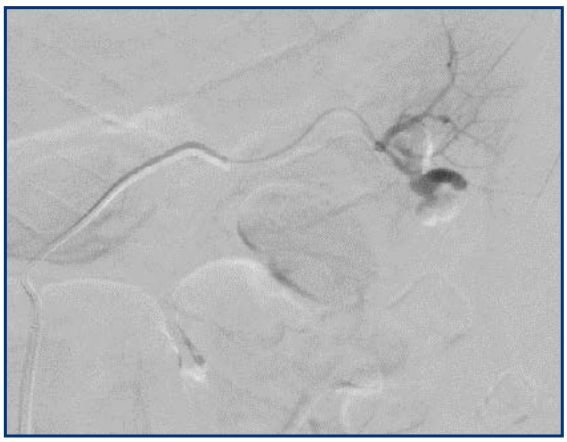
Grade 5 splenic laceration with findings suggestive of multiple splenic pseudoaneurysms. There has been an increase in amount of blood in the paracolic gutters and perihepatic space.

Pre-Embolization



Non-selective general splenic angiogram showing multiple areas of extravasation.

Access & Treatment

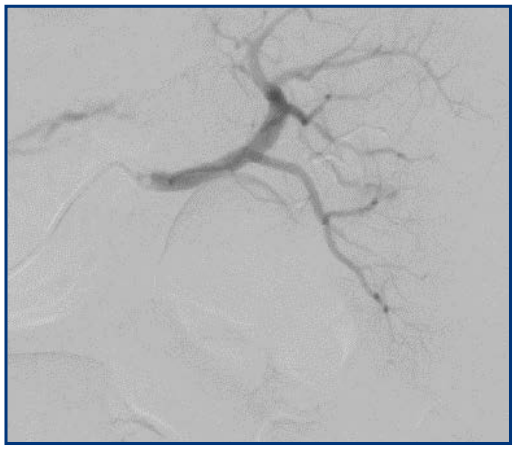


Sub-selective catheterization of targeted vessel

Splenic - Trauma **(cont')**

Parag Patel, MD, FSIR
Froedtert Medical College of Wisconsin
Milwaukee, WI

Access & Treatment



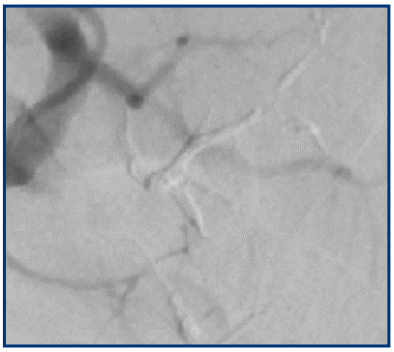
Post-embolization image displaying the LAVA cast in the target vessel confirming the resolution of the pseudoaneurysm and extravasation.

No adverse events.

Additional Treatments

2nd branch, in the lower pole of the spleen is subsequently selected for embolization

Confirmation of 2nd branch occlusion, and both LAVA casts



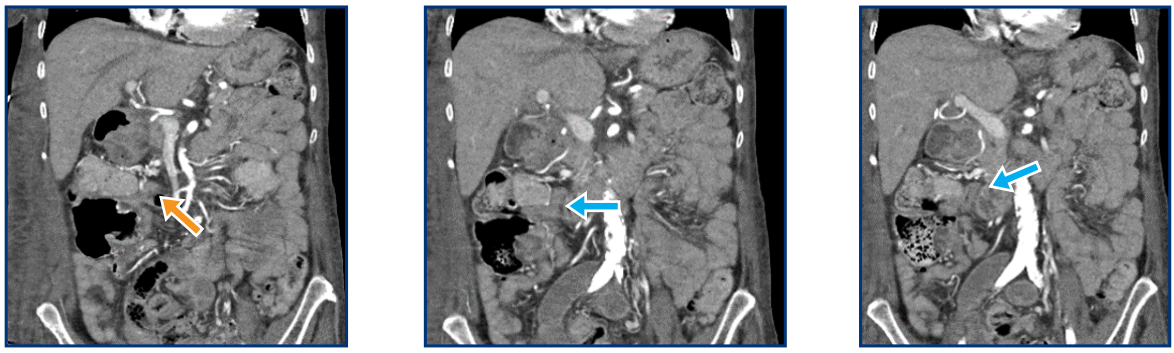
Magnified view of both LAVA casts

Gastroduodenal Hemorrhage

Chris Stark, MD
Albany Medical Center
Albany, NY

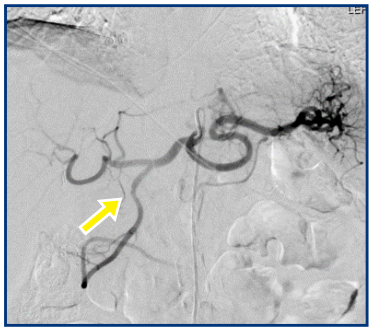
Patient Presentation

72-year-old female patient with ESRD presents with 2-day history of melena and a syncopal episode preceded by central abdominal pain.

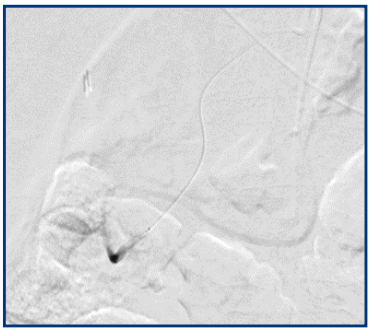


Coronal post-contrast CT images demonstrate a large duodenal ulcer (orange arrow). The gastroduodenal artery courses along the medial aspect of the ulcer (blue arrows).

Access & Treatment

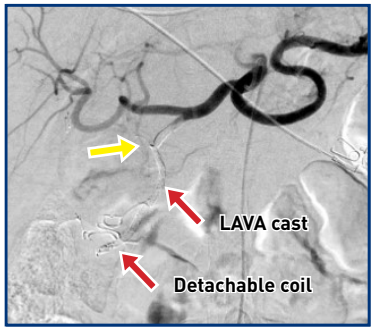


Celiac angiogram demonstrates a focal contour abnormality in the proximal segment of the gastroduodenal artery (yellow arrow), but no active extravasation or pseudoaneurysm. Due to endoscopic findings, prophylactic embolization of the gastroduodenal artery is planned.



A microcatheter is advanced into the proximal right gastroepiploic artery. A single detachable coil is placed as a distal backstop followed by embolization of the gastroduodenal artery with LAVA 34.

Post-Embolization



Post-embolization celiac angiogram demonstrates complete occlusion of the gastroduodenal artery. LAVA is seen filling a very small pseudoaneurysm of the proximal gastroduodenal artery, corresponding with the location of contour abnormality identified prior to embolization (yellow arrow). No adverse events observed.

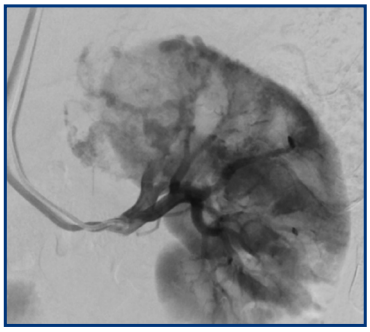
Renal Hemorrhage - AML

Jeremy I. Kim, MD
Charlotte Radiology
Charlotte, NC

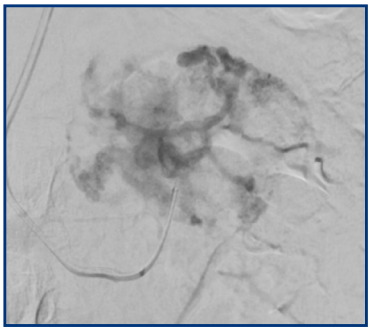
Patient Presentation

59-year-old male with no significant past medical history presenting with acute hemorrhage from ruptured 6.4 cm AML of the left kidney.

Pre-embolization coronal CT image

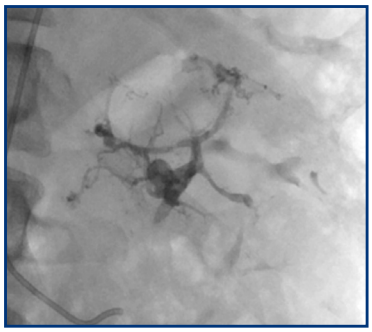


Pre-embolization angiogram of left kidney demonstrates hypervascular mass in the upper pole consistent with known AML.

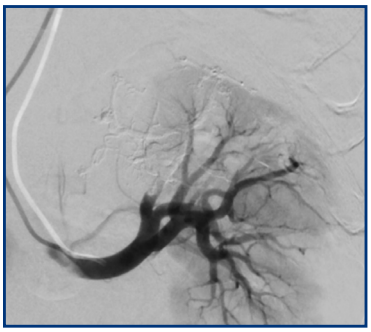


Selective angiogram of AML

Post- Embolization



Post-embolization spot image demonstrates excellent casting of the AML vasculature.



Post-embolization renal artery angiogram demonstrates no vascular flow to the AML and preserved vasculature to normal renal parenchyma.

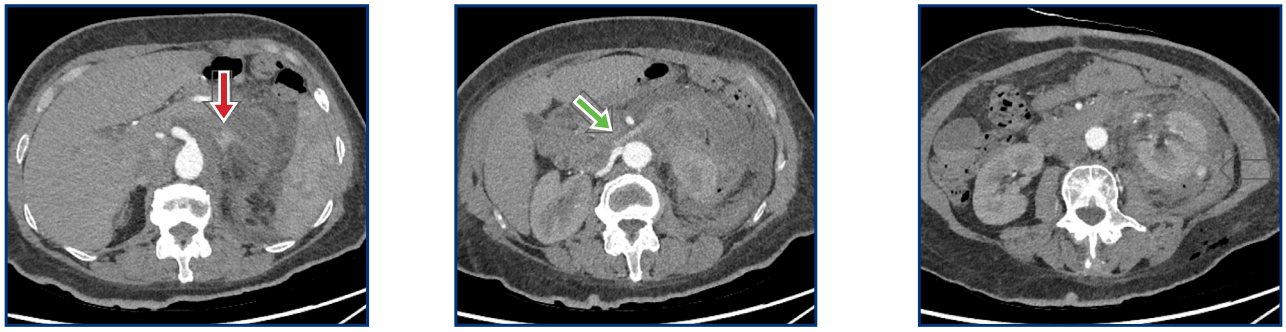
1-Month Follow Up shows no complications post-embolization. Coronal CT image demonstrating near-complete necrosis with smaller 5.3 cm size.

Renal Pseudoaneurysm

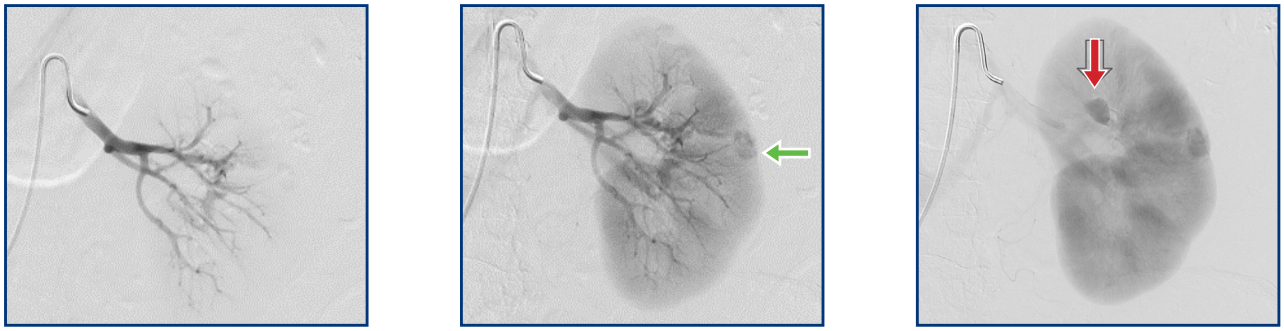
Gary Siskin, MD, FSIR
Albany Medical Center
Albany, NY

Patient Presentation

42-year-old male that underwent CT guided non-focal renal biopsy. Patient developed marked gross hematuria, dropping hemoglobin, low BP and was emergently transferred from an outside hospital.

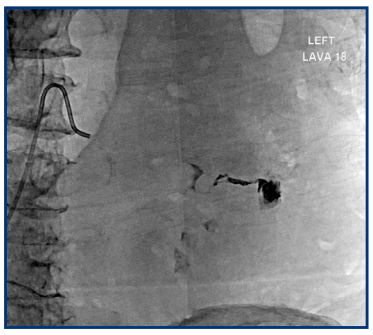


These images from CT scan showed evidence for active bleeding (red arrow), a peripheral pseudoaneurysm (green arrow) and a likely AV fistula (yellow arrow) after the biopsy.



These images from the initial renal angiogram showed evidence for a pseudoaneurysm (source of bleeding) in the periphery of the left kidney (green arrow) with additional abnormal contrast pooling in the more medial aspect of the kidney (red arrow).

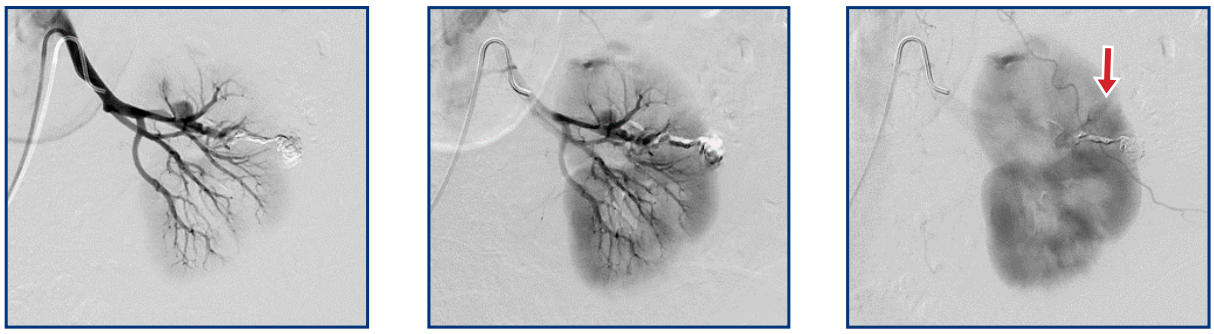
Treatment- Initial Bleed



This is an image following the administration of LAVA 18 into the mid-pole branch supplying a pseudoaneurysm where contrast extravasation was seen. No adverse events.

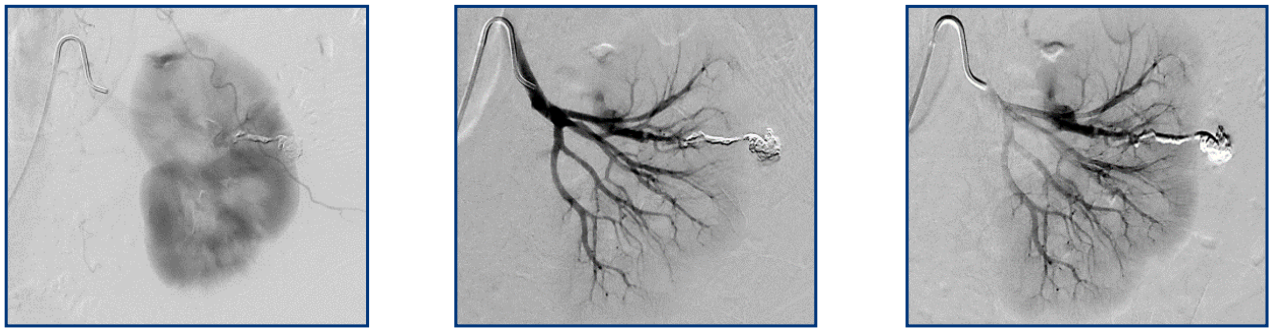
Renal Pseudoaneurysm (cont')

Gary Siskin, MD, FSIR
Albany Medical Center
Albany, NY

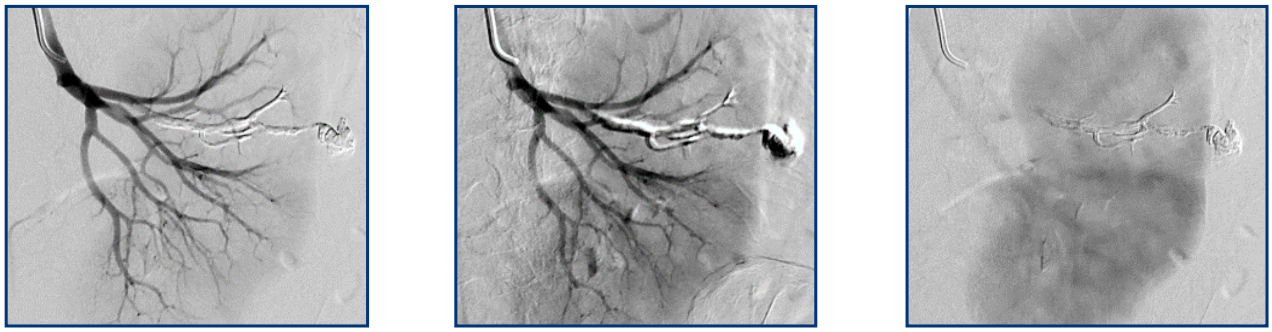


An angiogram after LAVA 18 administration showed good control of the peripheral bleeding, but additional bleeding was seen in the medial aspect of the upper pole (red arrow). This corresponded to the area of bleeding seen on CT.

Second LAVA Administration



Additional angiographic images showed that there was additional bleeding in the medial aspect of the upper pole of kidney that was likely arising from a more proximal position of the same artery supplying the original area of bleeding.



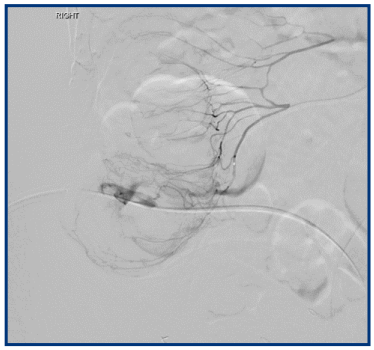
LAVA 18 was administered more proximally into the injured artery with good control of the bleeding at both sites. The target vessels was embolized in its entirety which impacted only a small percentage of the left kidney. No adverse events.

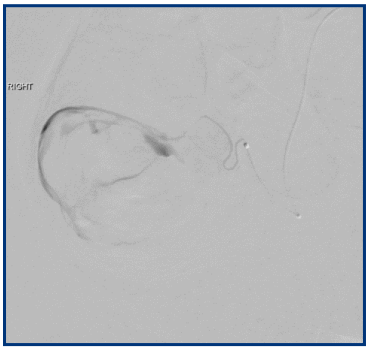
Cecal Artery - Hemorrhage

Bulent Arslan, MD, FSIR
RUSH University Medical Center
Chicago, IL

Patient Presentation

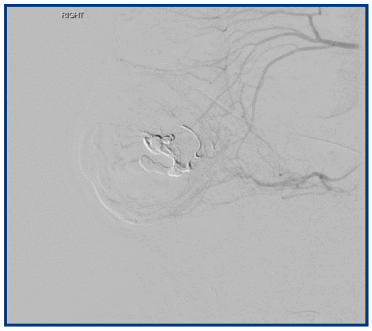
Lower GI Hemorrhage — Cecal



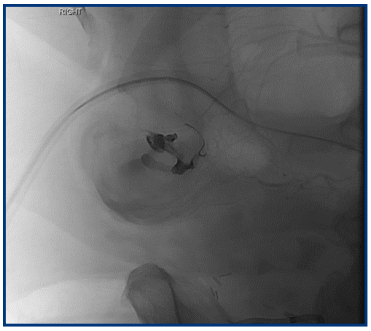


Cecal bleed from small submillimeter marginal branches — opted for LAVA 18 to travel distally to fill these small branches and treat the bleed.

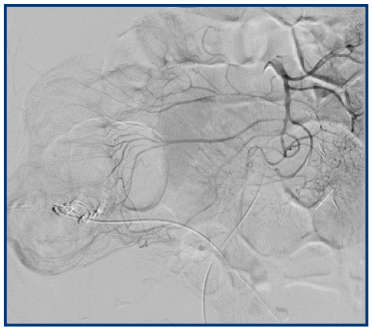
Access & Treatment



Catheterization



Injection of .6 mL of LAVA 18



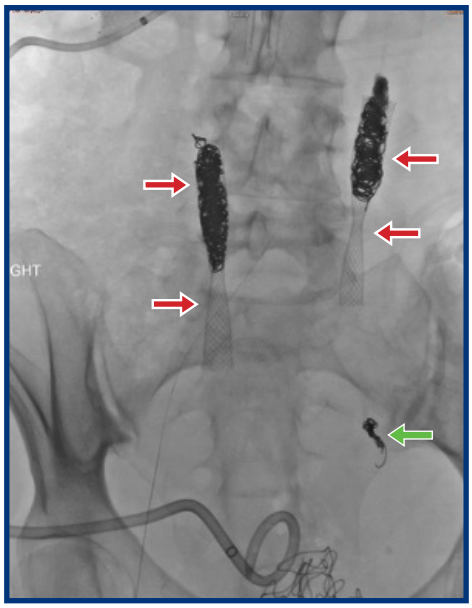
**Post-embolization:
Final angiogram from a more proximal approach does not show any bleeding.
No adverse events.**

Superior Gluteal Pseudoaneurysm

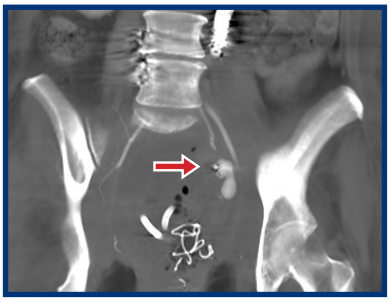
Ziv Haskal, MD, FSIR
University of Virginia
Charlottesville, VA

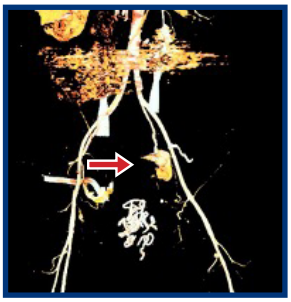
Patient Presentation

54-year-old female with advanced cervical cancer. Patient had past nephrostomies and intentional ureteral occlusion for vesicovaginal fistula (>2 years). Patient had unprecedented emergent massive vaginal bleeding and underwent coil embolization at outside hospital before being emergently transferred.



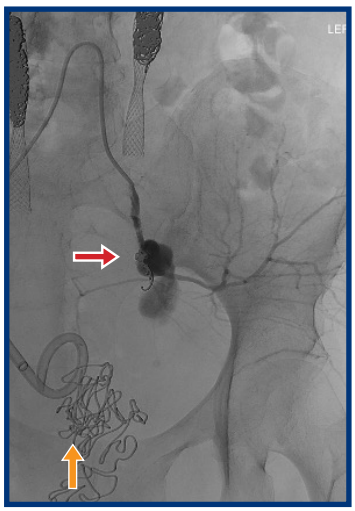
Previous nephrostomies and intentional ureteral occlusion for vesicovaginal fistula (red arrows)



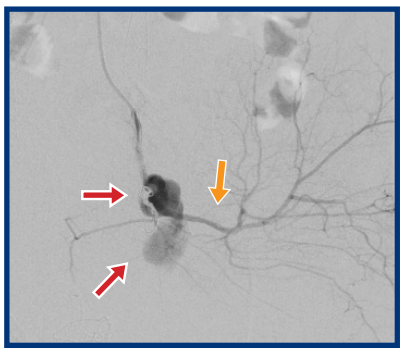


Left internal iliac artery as source of bleeding, despite coils previously placed at outside institution.

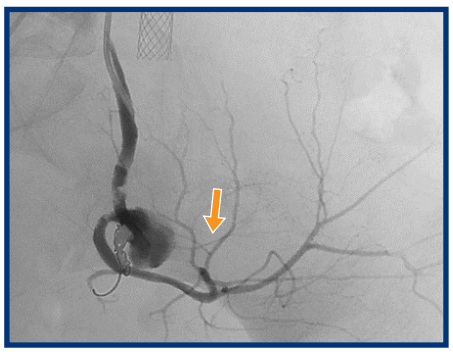
Mapping Angiography



Pseudoaneurysms identified (red arrow). Previously placed surgical packing coils (orange arrow).



Pseudoaneurysms identified (red arrows). Superior gluteal arteries (orange arrow).

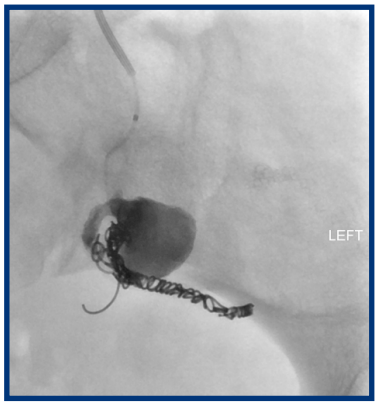


Superior gluteal arteries (orange arrow).

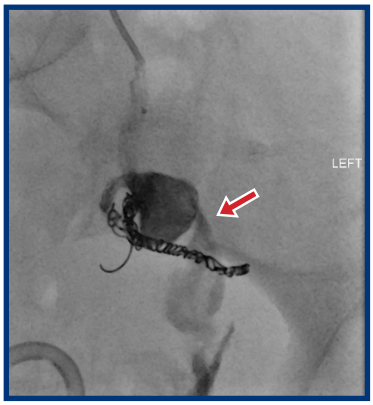
Superior Gluteal Pseudoaneurysm (cont')

Ziv Haskal, MD, FSIR
University of Virginia
Charlottesville, VA

Access and Treatment

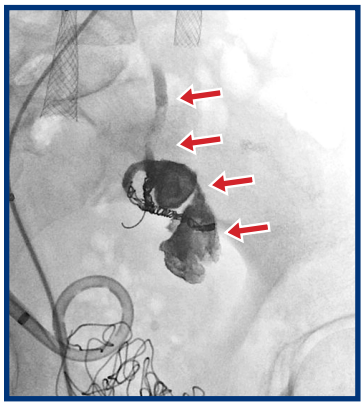


LAVA injected proximal to coils and spilling into pseudoaneurysm slowly over several minutes. Coils visible in superior gluteal artery.

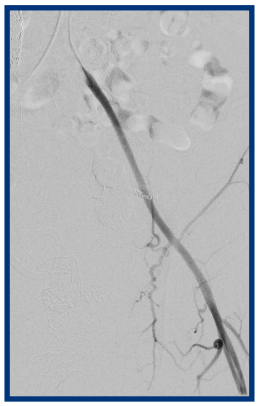


5 mL of LAVA 18 injected slowly over 4-5 minutes and advances forward into the second pseudoaneurysm.

Post-Embolization



Magnified view of LAVA cast.



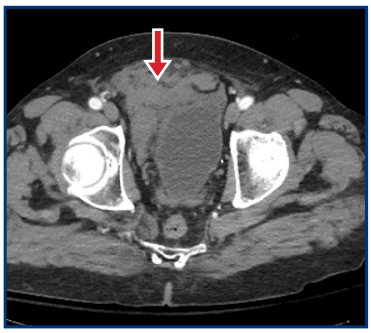
No evidence of further bleeding. Packing removed day after for emergent vaginal bleeding. No adverse events observed.

Distal Obturator Trauma

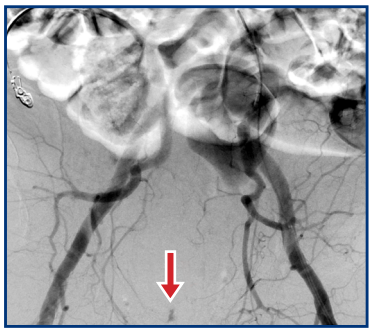
Gary Siskin, MD, FSIR
Albany Medical Center
Albany, NY

Patient Presentation

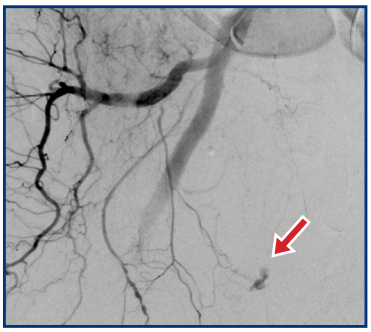
54-year-old male patient who was run over by a tractor. A CT scan was performed upon his presentation to the ER.



These images from the CT scan show a hematoma on the right side of the bleeding (red arrow), deviating the bladder to the left. In addition, there is active bleeding inferior to the bladder (green arrow).

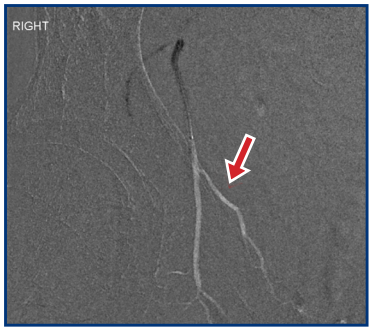


This image from the initial angiogram shows an area of active bleeding in the central portion of the pelvis (red arrow) which corresponded to the area on the CT scan.

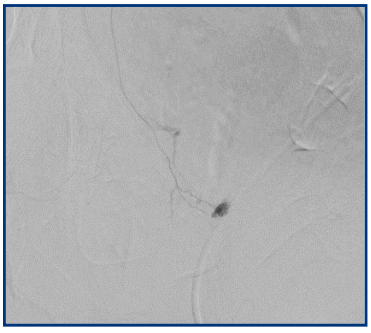


Angiography performed in an oblique projection shows the bleeding more clearly (red arrow) and also demonstrates the vessel where the bleeding is originating.

Access



This image shows the source vessel and the target for catheterizing the labelled vessel.



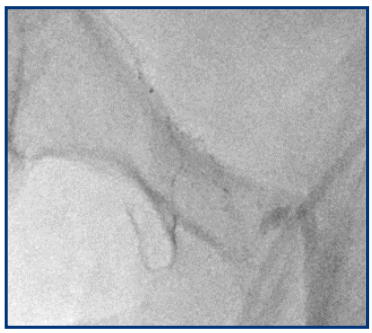
This image was taken after the catheter was in the vessel, showing the bleeding.

These images show the change in catheter position as it was moved closer to the site of bleeding.

Distal Obturator Trauma (cont')

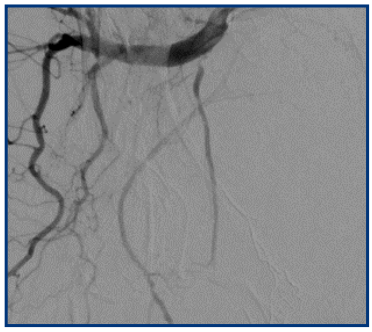
Gary Siskin, MD, FSIR
Albany Medical Center
Albany, NY

Administration

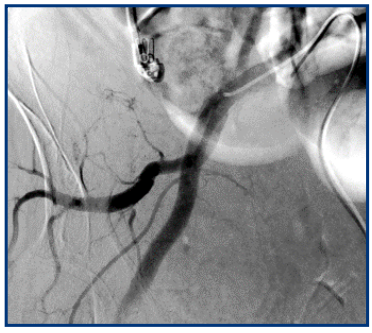


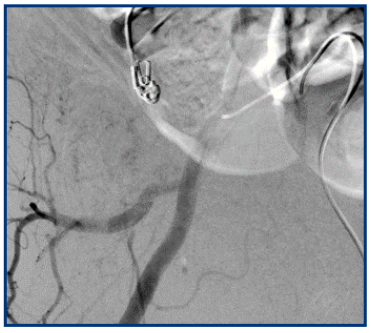
These images demonstrate how the LAVA occupies all branches of the target vessel.

Post- Embolization



Post-embolization image shows occlusion of the target branch. The LAVA is visualized on the subtraction images.





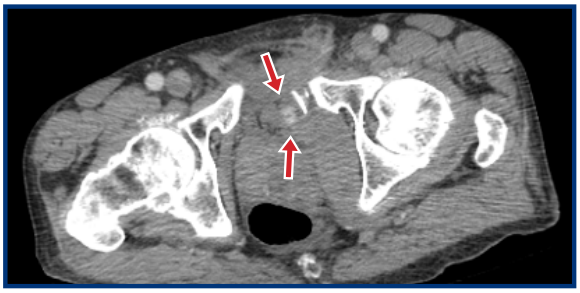
These images confirm occlusion of the target vessel with the LAVA. No bleeding is seen. No adverse events.

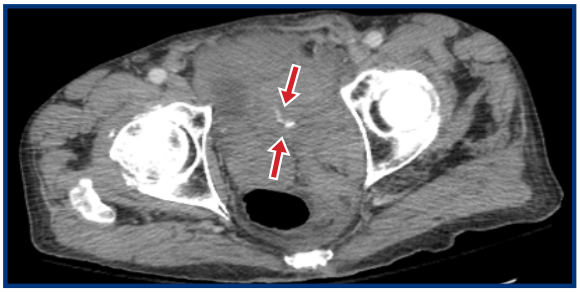
Obturator Pseudoaneurysm

Alexander Misono, MD, MBA, RPVI
Hoag Hospital Irvine
Irvine, CA

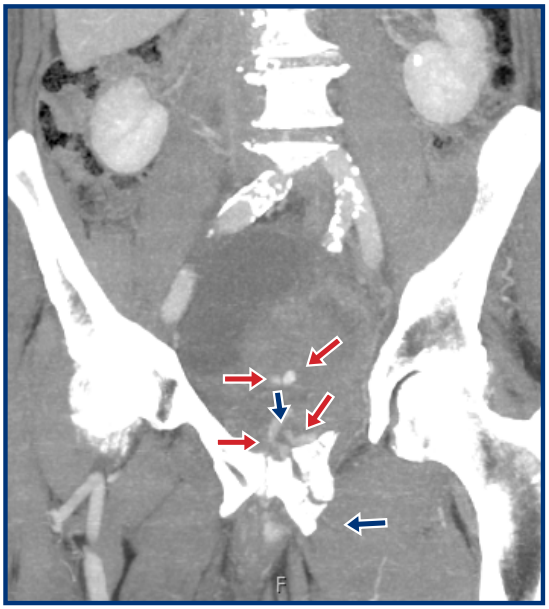
Patient Presentation

80-year-old male in Emergency Department after a recent fall, now with hemorrhagic shock, pelvic fracture, and CT angiogram revealing active extravasation in the pelvis.





CT (axial) shows several foci of active arterial extravasation (red arrows).



CT (coronal) show several foci of active arterial extravasation to the left of midline. Blue arrows point to the pelvic fracture.

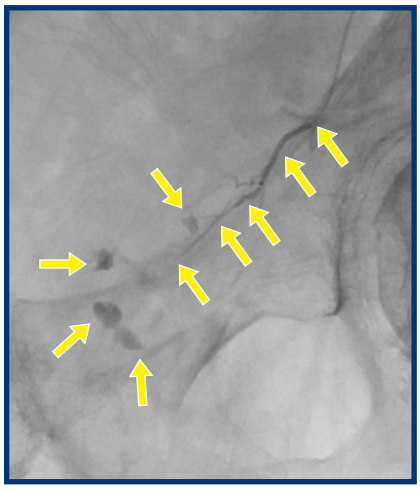
Left hypogastric angiogram shows active extravasation from obturator artery.

Selective angiography shows 4 separate pseudoaneurysms arising from pelvic branch.

Obturator Pseudoaneurysm - (cont')

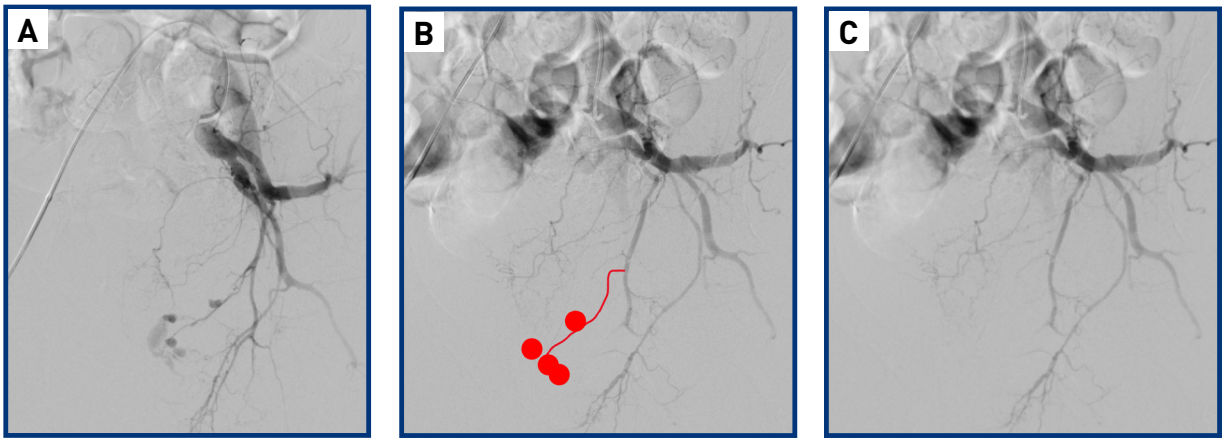
Alexander Misono, MD, MBA, RPVI
Hoag Hospital Irvine
Irvine, CA

Administration



0.2 mL of LAVA 18 is injected to achieve rapid occlusion of the bleeding branch. Embolization time took approximately 1 minute.

Post- Embolization



These images compare the initial angiogram (A) with the post-embolization angiogram (C), with a graphical depiction (red) of the excluded vascular territory including hemorrhage and pseudoaneurysms (B). There was immediate and complete resolution of bleeding after embolization with LAVA. No adverse events were observed.

Prostatic Artery - Iatrogenic Trauma

Michael Clifton, MD
University of Minnesota Medical Center
MN

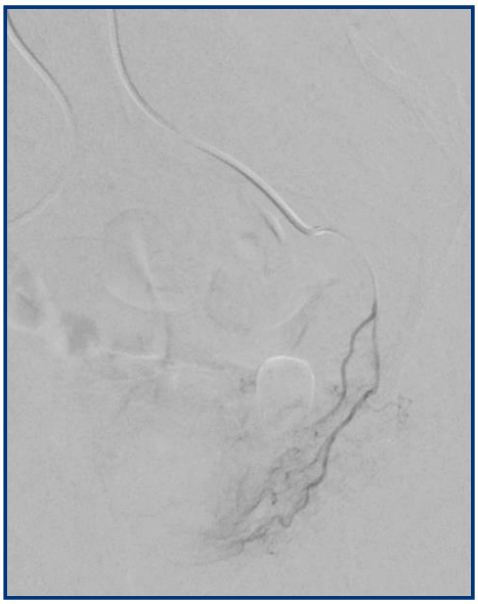
Patient Presentation

76 yo male w/ HFpEF, admitted due to scrotal pain and swelling with incidental morbidities. Shortly after discharge, patient is readmitted with grade 5 hematuria containing clots.

Pre-Embolization

Internal Iliac angiogram demonstrates patent left prostatic artery originating from the anterior division of the internal iliac artery with common origin of the vesicular artery.

Access & Treatment



A 2.0 Fr TruSelect catheter was advanced into the left prostatic artery which was thready and difficult to navigate.

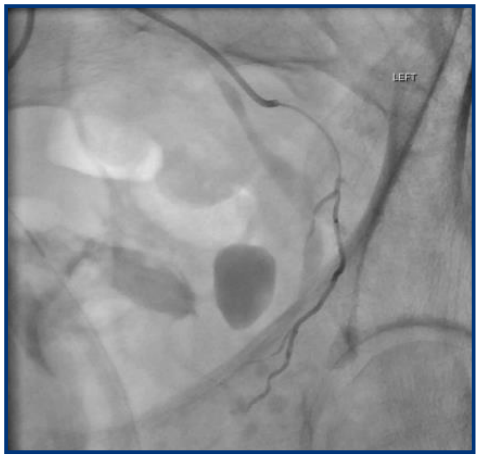
Angiogram demonstrated parenchymal blushing of the prostate from the left prostatic artery.

Attempted to catheterize the right prostatic artery, but due to stenosis of the ostium any attempts at cannulation were unsuccessful.

Prostatic Artery - Iatrogenic Trauma **(cont')**

Michael Clifton, MD
University of Minnesota Medical Center
MN

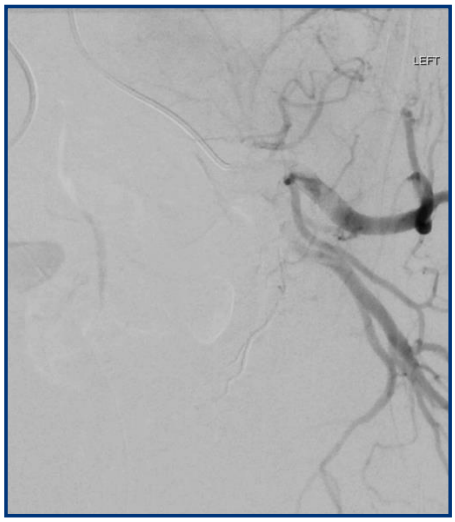
Access & Treatment Cont'



300 micrograms of nitro were injected prior to embolization.

0.5 mL of LAVA 18 were injected into the left prostatic artery.

Post-Embolization



Post-embolization angiogram of the left internal iliac artery demonstrates complete embolization of the left prostatic artery.

Hgb on DC was 9.6 even with the inability to embolize the contralateral side.

No adverse events observed.

Prostatic Artery Bleed - BPH

Jeremy I. Kim, MD
Charlotte Radiology
Charlotte, NC

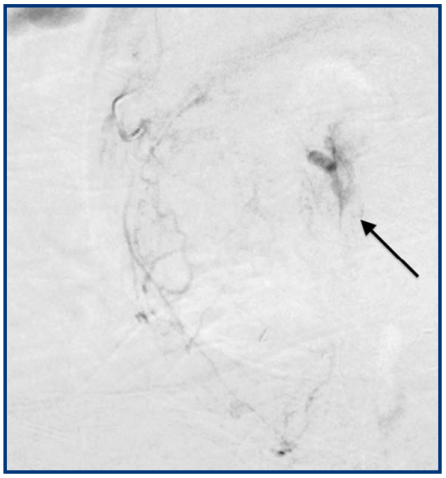
Patient Presentation

75 yo male with history of benign prostatic hyperplasia (BPH) (prostate volume 300 cc), lower urinary tract symptoms (LUTS) , hematuria of prostatic origin, and bladder stones measuring up to 1.6 cm.

Previous prostate MRI and biopsy workup negative for malignancy.

Prostatic Artery Embolization (PAE) performed via left radial artery access approach utilizing 1.9 F microcatheter.

Pre-Embolization



Pre-embolization image demonstrates active extravasation along the median lobe of the prostate gland.

Post-Embolization

Successful embolization with LAVA-18 to complete stasis. Spot image demonstrates casting of the prostatic arteries and LAVA at site of prior extravasation within prostatic urethra. Crossfilling to contralateral prostate gland also noted.

Post-embolization: Patient's hematuria resolved. He had successful planned urologic cystolitholapaxy with no complications. IPSS and QOL score also significantly reduced.

No adverse events observed.

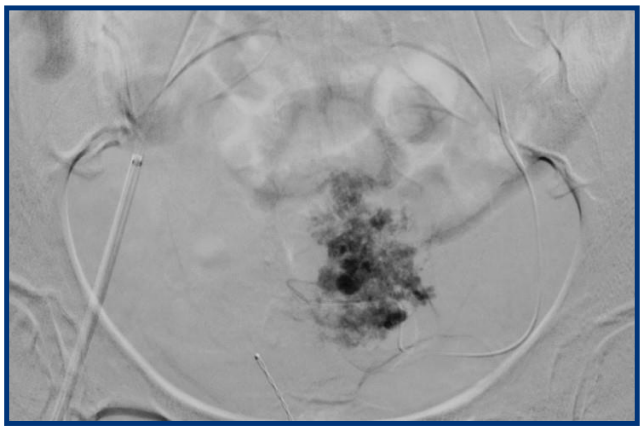
Uterine Artery Ruptured AVM

Daniel Kirkpatrick, MD
University of Michigan Medicine
Ann Arbor, MI

Patient Presentation

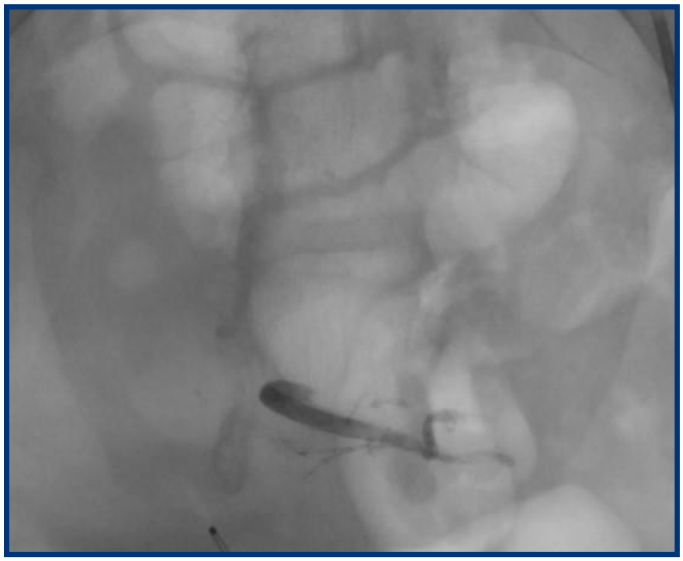
A 30-year-old female with recent miscarriage presented with persistent heavy vaginal bleeding following a Dilation & Curettage (D&C) complicated by intraoperative hemorrhage.

Pre-Embolization



Imaging confirmed a traumatic left uterine arteriovenous malformation with at least two associated pseudoaneurysms.

Access & Treatment

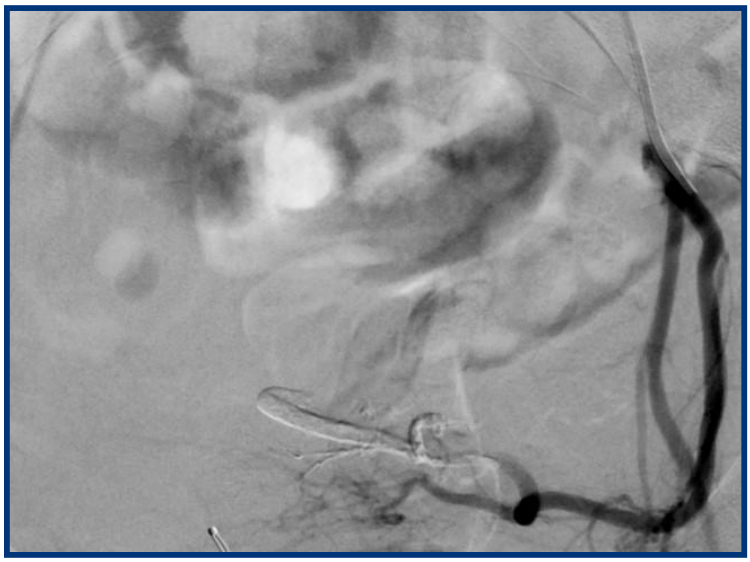


Distal transcatheter embolization of the left uterine artery using LAVA 18.

Uterine Artery Ruptured AVM - (cont')

Daniel Kirkpatrick, MD
University of Michigan Medicine
Ann Arbor, MI

Post-Embolization



Imaging demonstrated complete occlusion in the artery with no subsequent filling of the AVM.

The patient recovered without complication and was discharged after two days.

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