

Ultrasound – Doppler Pseudoaneurysm Evaluation

PURPOSE:

To evaluate the peripheral vasculature for the presence of pseudoaneurysm and arteriovenous fistula.

SCOPE:

Applies to all peripheral Doppler ultrasound studies performed in:

- UT Southwestern University Hospitals and Clinics, Imaging Services (UTSW)
- Parkland Health and Hospital System, Department of Radiology (PHHS)

INDICATIONS:

- Exam findings of pulsatile mass, bruit, or hematoma
- History of trauma, vascular injury, vascular access or other intervention
- Abnormal findings on other imaging
- Follow up of known pseudoaneurysm or arteriovenous fistula

CONTRAINDICATIONS:

- No absolute contraindications

EQUIPMENT:

- Preferably a linear array transducer that allows for appropriate resolution of anatomy (frequency range of 5 MHz or greater), capable of duplex imaging. Sector or curvilinear transducers may be required for appropriate penetration in patients with edema or large body habitus.

PATIENT PREPARATION:

- None

EXAMINATION:

GENERAL GUIDELINES:

A complete examination includes the evaluation of the focal or palpable abnormality concerning for the presence of a focal vascular malformation or injury, manifesting as a pseudoaneurysm or arteriovenous fistula.

EXAM INITIATION:

- Introduce yourself to the patient
- Verify patient identity using patient name and DOB
- Explain test
- Obtain patient history including symptoms. Enter and store data page
- Place patient in supine position with limb in question exposed.

TECHNICAL CONSIDERATIONS:

- Review any prior imaging, making note of any abnormalities in the region of interest.
- General
 - Proximal and distal refers to the relative distance from the attached end of the limb (eg. proximal femoral artery is closer to hip and distal is closer to knee).
 - Longitudinal axis is parallel to length of vessel. Transverse or short axis is perpendicular to long axis of vessel.
 - Evaluate entire length of the vessel(s) in question. For example, if an inguinal pseudoaneurysm is suspected, interrogate the external iliac, common femoral, and superficial femoral arteries.
 - Interrogate the artery and vein proximal to, at, and distal to any suspected arteriovenous fistula.
 - Note anatomic variations such as duplications.
 - Evaluate for nonvascular pathology such as adenopathy, aneurysm, hematoma, etc. Include images without and with color Doppler and measurements.
- Grayscale Evaluation
 - Optimize gray scale gain and display settings with respect to depth, dynamic range, and focal zones.
 - Adjust dynamic range (image compression) to help distinguish artifact from slow flow or intraluminal true clot.
 - Refrain from increasing power/gain.
- Doppler
 - Utilize color Doppler with proper color scale and color box size targeted to the vessel under interrogation. Interrogate vessels and any abnormal collections for aliasing (turbulent or focal high-velocity flow).
 - Use color Doppler to survey for any arteriovenous fistula. Color Doppler is particularly useful for identifying the level of such communications because the flow disturbances in a fistula often creates color in the adjacent soft tissue from transmitted vibrations and pressure changes (color bruit).
 - If to-and-fro Doppler flow is identified, record visual flow changes with cine images.
 - Spectral Doppler waveforms must be obtained using an angle of 45-60 degrees between the skin and the transducer.
 - For spectral Doppler, evaluate vessels in long axis. Adjust scale to avoid aliasing.

DOCUMENTATION:

- If Pseudoaneurysm suspected:
 - Suspected Pseudoaneurysm Sac:
 - Entire sac including any thrombosed components, if present (hematoma):
 - Transverse and longitudinal images, with and without color Doppler
 - Measurements in 3 dimensions
 - Residual Lumen (fluid component)
 - Transverse and longitudinal images, with and without color Doppler
 - Measurements of residual lumen in 3 dimensions
 - Spectral Doppler of flow within sac
 - Neck:
 - Gray scale and color Doppler images
 - Measurements (length and width) of neck
 - Connection to parent vessel, if identified
 - Spectral Doppler of flow pattern in neck
 - Evaluation of feeding artery and regional/draining veins, depending on location
**(Example for suspected inguinal pseudoaneurysm and/or arteriovenous fistula)
 - Longitudinal
 - Arteries - Gray scale, color and spectral Doppler
 - Eg. Superficial femoral artery proximal to pseudoaneurysm/fistula. Common femoral artery, if necessary
 - Veins - Gray scale, color and spectral Doppler
 - Eg. Common femoral vein proximal to pseudoaneurysm/fistula, Femoral vein, Profunda femoral vein, External iliac vein, if necessary
- If no pseudoaneurysm is suspected, but focal mass identified
 - Focal Mass or hematoma
 - Transverse and longitudinal images with and without color Doppler
 - Measurements in 3 dimensions of the entire focal mass/hematoma
 - Evaluation of adjacent/dominant artery and regional/draining vein in that area
 - Longitudinal
 - Arteries - Gray scale, color and spectral Doppler
 - Veins - Gray scale, color and spectral Doppler
- Data page(s)

UT Southwestern Department of Radiology

Anatomy	3 measurements	Gray Scale	Color Doppler	Waveform	PSV
Pseudoaneurysm (PSA) Doppler Evaluation Documentation					
Entire PSA Sac (lumen + hematoma)	x	x	x		
Residual PSA patent lumen	x	x	x	x	
Neck	x *2 measurements	x	x	x	x
Parent/Adjacent Artery , Prox to PSA		x	x	x	x
Parent/Adjacent Artery , nearest PSA		x	x	x	x
Parent/Adjacent Artery , Distal to PSA		x	x	x	x
Parent/Adjacent Vein , Distal to PSA		x	x	x	x
Parent/Adjacent Vein , nearest PSA		x	x	x	x
Parent/Adjacent Vein , Prox to PSA		x	x	x	x
Focal mass identified, but no PSA identified					
Focal Mass	x	x	x		
Parent/Adjacent Artery , Prox to mass		x	x	x	x
Parent/Adjacent Artery , nearest mass		x	x	x	x
Parent/Adjacent Vein , nearest mass		x	x	x	x
Parent/Adjacent Vein , Prox to mass		x	x	x	x

PROCESSING:

- Review examination images and data
- Export all images to PACS
- Document relevant history and any study limitations in Imorgon worksheet

REFERENCES:

- ACR-AIUM-SRU Practice Guideline (Revised 2014)
- IAC Guidelines (Updated 2018)

REVISION HISTORY:

SUBMITTED BY:	David T. Fetzer, MD	Title	Medical Director
APPROVED BY:	David T. Fetzer, MD	Title	Medical Director
APPROVAL DATE:			
REVIEW DATE(S):	10-02-2018		Julie Champine, MD
REVISION DATE(S):	10-02-2018	Brief Summary	
	10-30-2024	Added images, table, and clarified statements, reformatted Documentation section to be clearer	Jana Smith, RDMS, RVT, Skye Smola, RDMS, RVT

APPENDIX:

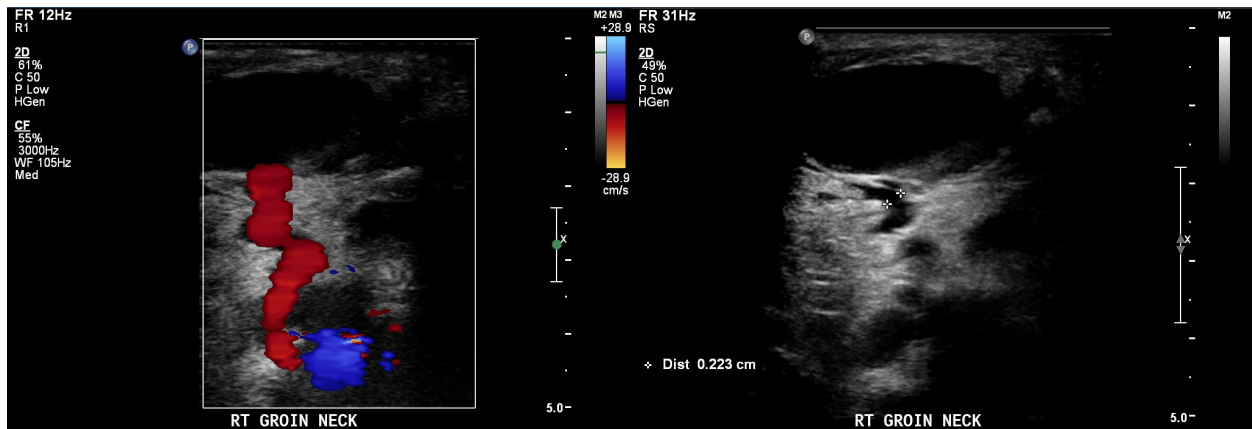
Example Case: 56 y/o male with right groin hematoma at femoral catheterization site.



A.

B.

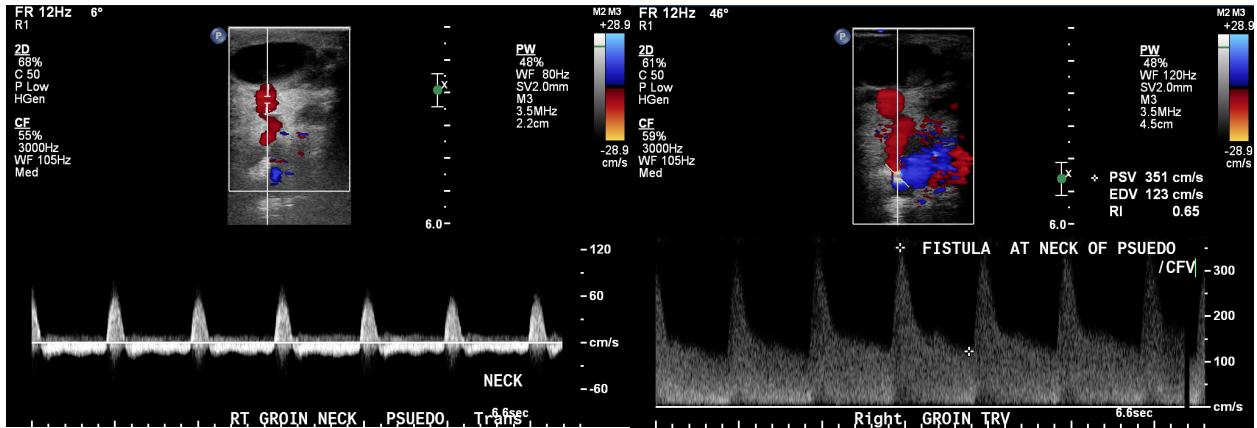
Gray scale image of the right groin (A) shows a well-defined fluid-filled structure containing low-level echoes. With Color Doppler (B), classic “ying-yang” to-and-fro flow pattern is show, characteristic for a pseudoaneurysm.



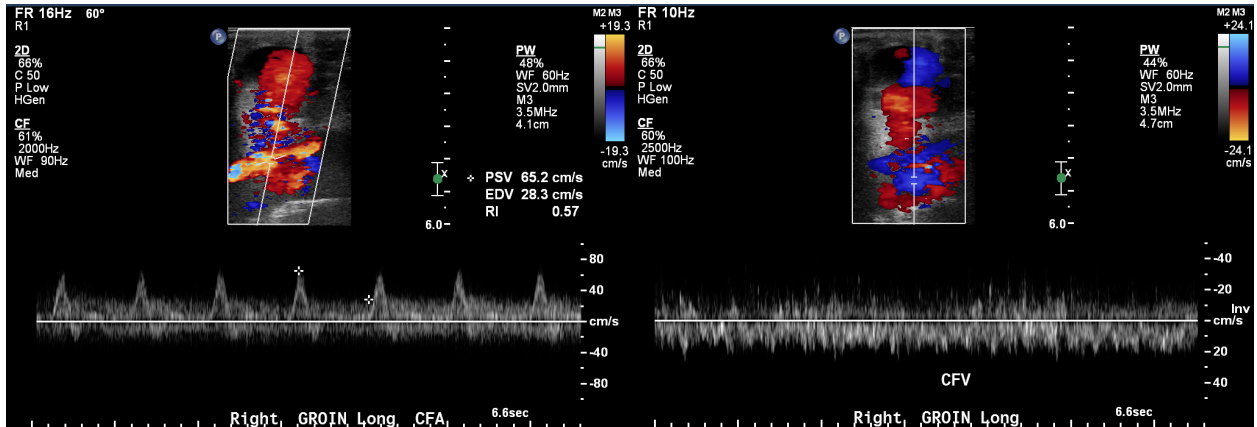
C.

D.

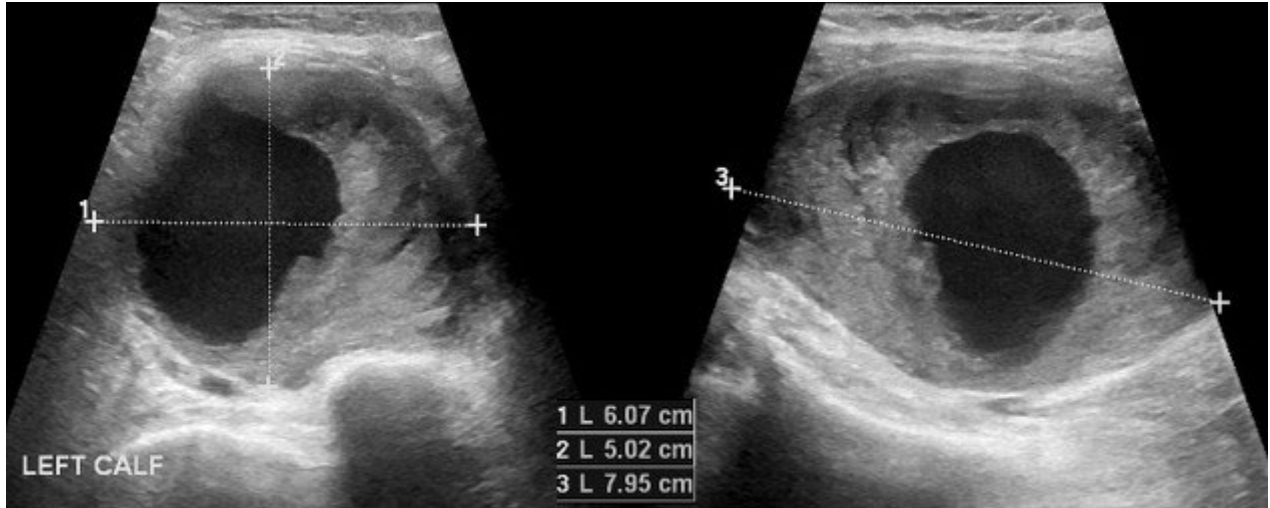
A tract showing color Doppler flow (C) extends from the adjacent common femoral artery (CFA) into the pseudoaneurysm—the “neck”. A measurement of the neck width is shown in D.



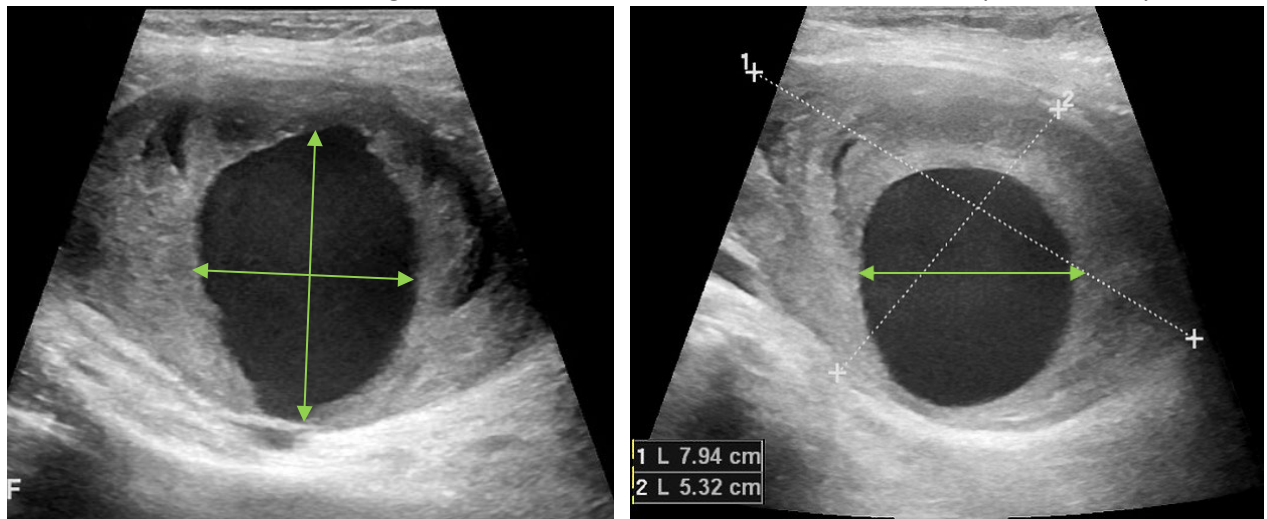
E. Spectral Doppler along the pseudoaneurysm neck (E) show's bidirectional flow "to-fro flow" (flow into and out of the pseudoaneurysm sac). Spectral Doppler at the origin of the neck at the common femoral artery (F) shows low-resistance, high-velocity flow with spectral broadening.



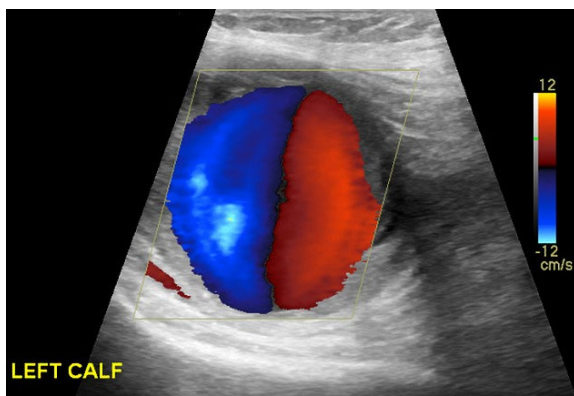
G. Spectral Doppler of the adjacent proximal CFA (G) shows abnormal low-resistance flow. Spectral Doppler of the adjacent common femoral vein fails to show pulsatile flow, excluding a component of arteriovenous (A-V) fistula.



I. Measure the entire sac, including both the thrombosed and residual lumen of the pseudoaneurysm.



J. Transverse image measuring residual lumen in green, width (J). Longitudinal image measuring residual patent lumen in green, length and AP (K).



L. Ying-Yang sign with Color Doppler (L)