

## Instructor's Digital Curriculum Resource-

### For Techniques in Noninvasive Vascular Diagnosis-4th edition.

by Robert J. Daigle, BA, RVT, RVS, FSVU, FSDMS

Produced by Summer Publishing, LLC

This collection is designed to aid instructors and students that are using the textbook Techniques in Noninvasive Vascular Diagnosis. Summer Publishing authorizes and licenses the use of this COPYRIGHTED material contained in this collection to the school educational program. Use of the slides, graphics, case studies or movies for endeavors outside the activities of the school is prohibited without written permission from Summer Publishing.

From: Techniques in Noninvasive Vascular Diagnosis-4th Ed. Summer Publishing, LLC. Copyright 2014 Robert Daigle

## Instructor's Digital Curriculum Resource-

Hyperlinks have been incorporated into images throughout the slide collection.

You must have an internet connection for hyperlinks to work. It's also useful to have a browser open and running on you PC while in slide show mode.

Alternatively, the movies can be re-inserted into PowerPoint

After viewing the You Tube video demo, return to Powerpoint, select Presenters View or Slideshow to continue.

From: Techniques in Noninvasive Vascular Diagnosis-4th Ed. Summer Publishing, LLC. Copyright 2014 Robert Daigle

## Chapter 11. Color Duplex Imaging- Lower Extremities

### Techniques In Noninvasive Vascular Diagnosis-4th edition

From: Techniques in Noninvasive Vascular Diagnosis-4th Ed. Summer Publishing, LLC. Copyright 2014 Robert Daigle

## Definitions for this chapter

- **NPO**- Nothing by mouth
- **Vein graft** – a vein converted to use as an artery to bypass an occluded arterial segment
- **xiphoid process**- the lower part of the sternum
- **Umbilicus**- your bellybutton

From: Techniques in Noninvasive Vascular Diagnosis-4th Ed. Summer Publishing, LLC. Copyright 2014 Robert Daigle

## Definitions for this chapter

- **Infrainguinal**- distal to the inguinal ligament (groin crease)
- **Patent** – open
- **Percutaneous**- through the skin

From: Techniques in Noninvasive Vascular Diagnosis-4th Ed. Summer Publishing, LLC. Copyright 2014 Robert Daigle

## Color Duplex Imaging

- **Goals:**
  - Identify exact site of disease
  - Differentiate stenosis versus occlusion
  - Define length of occlusion
  - Identify aneurysms

From: Techniques in Noninvasive Vascular Diagnosis-4th Ed. Summer Publishing, LLC. Copyright 2014 Robert Daigle

## Color Duplex Imaging

- **Goals:**
  - Identify and guide treatment of pseudoaneurysms
  - Identify AVF, AVM, and venous malformations.
  - Adjunct to physiologic testing
  - Post-op evaluation of bypass grafts and stents

From: Techniques in Noninvasive Vascular Diagnosis-4<sup>th</sup> Ed. Summer Publishing, LLC. Copyright 2014 Robert Dargatzis

## Lower Extremity Segments

- **Aorto-iliac**
  - This segment is challenging due to depth of vessels, bowel gas, and obesity.
- **Femoro-popliteal segment**
  - This area should be scanned before the AI segment, as most PAD in the legs occurs here
- **Tibial arteries**
  - Difficult to image when diseased, as they're very small with low flow.

From: Techniques in Noninvasive Vascular Diagnosis-4<sup>th</sup> Ed. Summer Publishing, LLC. Copyright 2014 Robert Dargatzis

## Aorto-iliac Segment, image for:

- **Aneurysm**
- **Aortic dissection**
- **Stenosis-occlusion**



From: Techniques in Noninvasive Vascular Diagnosis-4<sup>th</sup> Ed. Summer Publishing, LLC. Copyright 2014 Robert Dargatzis

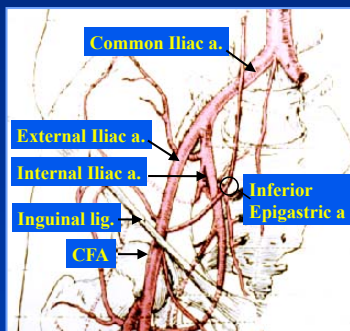
## Need to scan A-I segment for occlusive disease ?

### Consider:

- **Thigh PVR waveform**
- **Thigh pressure**
- **CFA Doppler waveform**
- **Femoral pulse**

A Normal study rules out significant A-I disease, but not minor stenosis.

From: Techniques in Noninvasive Vascular Diagnosis-4<sup>th</sup> Ed. Summer Publishing, LLC. Copyright 2014 Robert Dargatzis



From: Techniques in Noninvasive Vascular Diagnosis-4<sup>th</sup> Ed. Summer Publishing, LLC. Copyright 2014 Robert Dargatzis

## Optimal Patient Preparation

- **NPO for 8 hrs prior**
- **Perform exam in am.**
- **Patients may take clear liquids, medications**
- **Diabetics - appropriate nourishment**
- **No smoking prior, or chewing gum**

From: Techniques in Noninvasive Vascular Diagnosis-4<sup>th</sup> Ed. Summer Publishing, LLC. Copyright 2014 Robert Dargatzis

## Imaging Technique for A-I Segment

- Use a 2.5 - 3.5 MHz curved or phased array transducer
- Apply appropriate transducer pressure in abdomen
- Identify abdominal aorta in transverse at the umbilicus, look for aneurysm

From: Techniques in Noninvasive Vascular Diagnosis-4<sup>th</sup> Ed. Summer Publishing, LLC. Copyright 2014 Robert Daghe

## Method

- Position the transducer in transverse plane in midline between the xiphoid process and the umbilicus and identify the aorta.



From: Techniques in Noninvasive Vascular Diagnosis-4<sup>th</sup> Ed. Summer Publishing, LLC. Copyright 2014 Robert Daghe

## Method

- Measure AP and lateral dimensions of aorta.
- Turn longitudinal and scan aorta, then iliacs origins



Normal abd. aorta  
1.33 cm x 1.24 cm

From: Techniques in Noninvasive Vascular Diagnosis-4<sup>th</sup> Ed. Summer Publishing, LLC. Copyright 2014 Robert Daghe

## Look for Aneurysm

- Dilatation and expansion of arterial wall
- May contain thrombus, platelet aggregates, debris.



*abdominal aortic aneurysm*

## Aortic Aneurysm and Dissection

see Chapter 16-  
Abdominal Doppler

From: Techniques in Noninvasive Vascular Diagnosis-4<sup>th</sup> Ed. Summer Publishing, LLC. Copyright 2014 Robert Daghe

## Aneurysm size “rule of thumb”

- $\geq 3$  cm - abdominal aorta
- $\geq 2$  cm - iliac artery
- $\geq 1$  cm - popliteal artery

From: Techniques in Noninvasive Vascular Diagnosis-4<sup>th</sup> Ed. Summer Publishing, LLC. Copyright 2014 Robert Daghe

## Doppler Methods

- Evaluate the Aorta for stenosis-occlusion
- Scan into the common iliac artery (CIA) and follow into the external iliac artery (EIA)
- Use color Doppler (unless there's excessive "noise" artifact due to bowel gas.

From: Techniques in Noninvasive Vascular Diagnosis-4<sup>th</sup> Ed. Summer Publishing, LLC. Copyright 2014 Robert Dargatzis

## Doppler Methods

- Obtain spectral waveforms from Aorta, CIA and proximal EIA.
- If possible, obtain a waveform at the proximal internal iliac artery (IIA)
- Follow the course of the EIA to the groin.

From: Techniques in Noninvasive Vascular Diagnosis-4<sup>th</sup> Ed. Summer Publishing, LLC. Copyright 2014 Robert Dargatzis

## Obtain Aorta Waveform



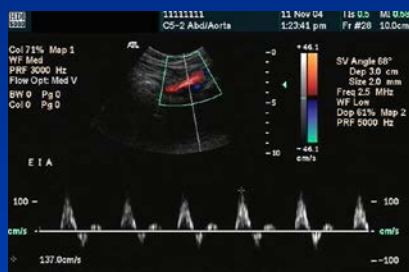
From: Techniques in Noninvasive Vascular Diagnosis-4<sup>th</sup> Ed. Summer Publishing, LLC. Copyright 2014 Robert Dargatzis

## Common Iliac Artery



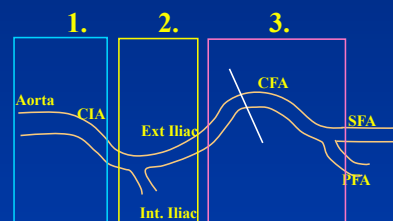
From: Techniques in Noninvasive Vascular Diagnosis-4<sup>th</sup> Ed. Summer Publishing, LLC. Copyright 2014 Robert Dargatzis

## External Iliac Artery



From: Techniques in Noninvasive Vascular Diagnosis-4<sup>th</sup> Ed. Summer Publishing, LLC. Copyright 2014 Robert Dargatzis

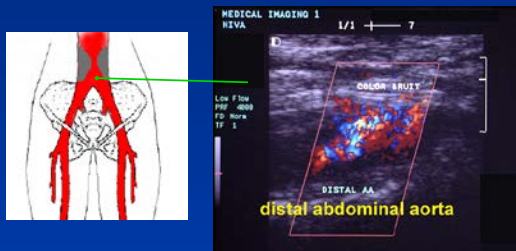
## Iliac arteries: scan in "zones"



If scanning the entire contiguous segment is not possible, scan in Zones, 1, 3, then make zone 2 as short as possible

From: Techniques in Noninvasive Vascular Diagnosis-4<sup>th</sup> Ed. Summer Publishing, LLC. Copyright 2014 Robert Dargatzis

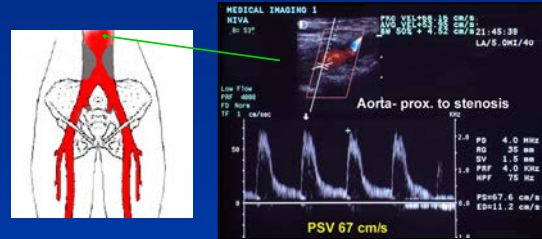
### Abdominal aortic stenosis



### Aortic color bruit

From: Techniques in Noninvasive Vascular Diagnosis-4th Ed. Summer Publishing, LLC. Copyright 2014 Robert Dagle

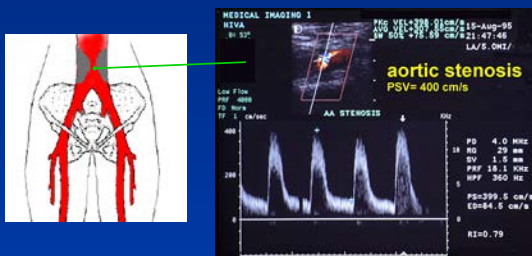
### Abdominal aortic stenosis



### Pre- stenosis

From: Techniques in Noninvasive Vascular Diagnosis-4th Ed. Summer Publishing, LLC. Copyright 2014 Robert Dagle

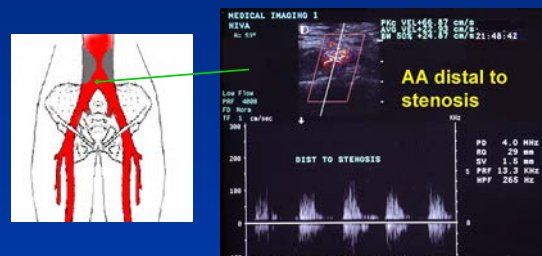
### Abdominal aortic stenosis



### Maximum stenosis

From: Techniques in Noninvasive Vascular Diagnosis-4th Ed. Summer Publishing, LLC. Copyright 2014 Robert Dagle

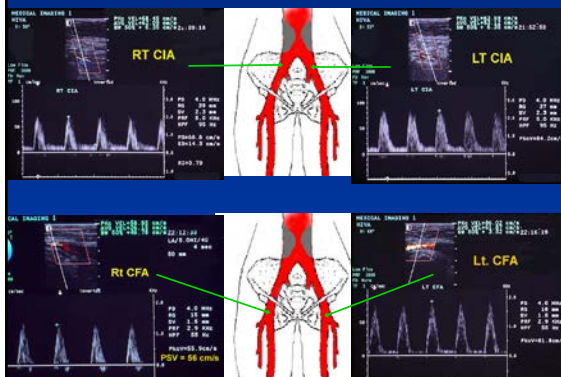
### Abdominal aortic stenosis



### Post - stenotic turbulence

From: Techniques in Noninvasive Vascular Diagnosis-4th Ed. Summer Publishing, LLC. Copyright 2014 Robert Dagle

### Abdominal aortic stenosis



### Aorto-iliac Interpretation

- Occlusion - No flow by spectral and color Doppler
- Velocity increase over stenosis with a velocity ratio less than 2:1, and post sten. turbulence
- > 50% Stenosis- a 2 to 1 increase in velocity (a doubling) of velocity over the stenosis, followed by post stenotic turbulence

From: Techniques in Noninvasive Vascular Diagnosis-4th Ed. Summer Publishing, LLC. Copyright 2014 Robert Dagle

## Aorto-iliac Interpretation

- In the presence of severe CIA stenosis or occlusion, flow direction may reverse in the IIA (to supply the EIA). Pay attention to flow direction.

From: Techniques in Noninvasive Vascular Diagnosis-4<sup>th</sup> Ed. Summer Publishing, LLC. Copyright 2014 Robert Dargatzis

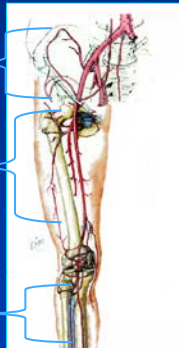
## Color Duplex - Aorta and Iliacs Disadvantages- Problems

- Time consuming and difficult
- Color flash artifact
- Depth
- Bowel gas
- Respiratory motion

From: Techniques in Noninvasive Vascular Diagnosis-4<sup>th</sup> Ed. Summer Publishing, LLC. Copyright 2014 Robert Dargatzis

## Imaging Native Arteries

- Aorto-iliac - *difficult*
- Fem-popliteal - *easiest*
- Tibial arteries - *tedious*



From: Techniques in Noninvasive Vascular Diagnosis-4<sup>th</sup> Ed. Summer Publishing, LLC. Copyright 2014 Robert Dargatzis

## Femoro-popliteal segment

### Color Duplex Technique:

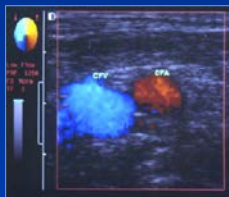
- Patient supine (for CFA), head slightly elevated for patient comfort
- Use 4 – 12 MHz transducer with 3.0 – 4.5 MHz Doppler
- Start at inguinal crease
- Get close to the leg (don't be afraid to reposition the patient horizontally on the bed)

From: Techniques in Noninvasive Vascular Diagnosis-4<sup>th</sup> Ed. Summer Publishing, LLC. Copyright 2014 Robert Dargatzis

## Femoro-popliteal segment

### Color Duplex Technique:

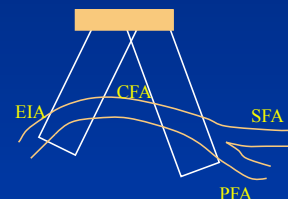
- Identify CFA in transverse (or palpate pulse), then go longitudinal



From: Techniques in Noninvasive Vascular Diagnosis-4<sup>th</sup> Ed. Summer Publishing, LLC. Copyright 2014 Robert Dargatzis

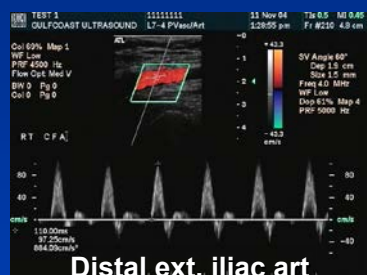
## Femoro-popliteal segment

Optimize:  
Color steering  
Frame rate  
Color gain  
Color scale (PRF)



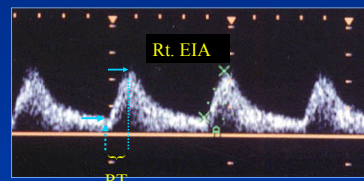
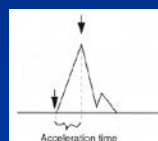
From: Techniques in Noninvasive Vascular Diagnosis-4<sup>th</sup> Ed. Summer Publishing, LLC. Copyright 2014 Robert Dargatzis

## Obtain spectral waveforms from EIA, measure PSV



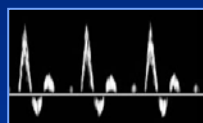
From: Techniques in Noninvasive Vascular Diagnosis-4<sup>th</sup> Ed. Summer Publishing, LLC. Copyright 2014 Robert Dagle

## Optional- Measure Rise Time



> 0.14 sec (> 144 ms) is abnormal and indicates > 75% A-I stenosis

From: Techniques in Noninvasive Vascular Diagnosis-4<sup>th</sup> Ed. Summer Publishing, LLC. Copyright 2014 Robert Dagle



- Obtain Spectral waveforms from CFA, SFA, PFA
- Scan course of SFA- popliteal a. with color Doppler
- Map any areas of flow disturbance

From: Techniques in Noninvasive Vascular Diagnosis-4<sup>th</sup> Ed. Summer Publishing, LLC. Copyright 2014 Robert Dagle

## Imaging Caveat

- After obtaining a proximal SFA waveform, perform a "cursory" scan along the entire SFA and popliteal.
- Don't record or document, just perform a quick "survey". This will reveal distal occlusion (if present) or anatomy variants.
- After the survey, return to formally document your findings

From: Techniques in Noninvasive Vascular Diagnosis-4<sup>th</sup> Ed. Summer Publishing, LLC. Copyright 2014 Robert Dagle

## Occluded SFA

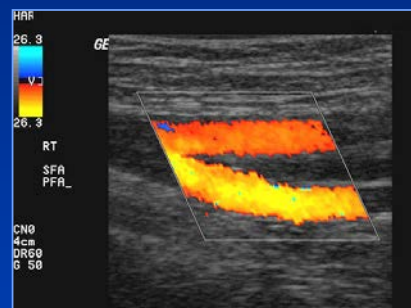
No need to document these if SFA is occluded distally



From: Techniques in Noninvasive Vascular Diagnosis-4<sup>th</sup> Ed. Summer Publishing, LLC. Copyright 2014 Robert Dagle

## Femoro-popliteal segment

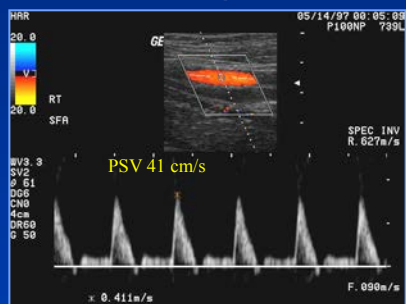
### Pt. H, Rt SFV & PFA



From: Techniques in Noninvasive Vascular Diagnosis-4<sup>th</sup> Ed. Summer Publishing, LLC. Copyright 2014 Robert Dagle

Femoro-popliteal segment

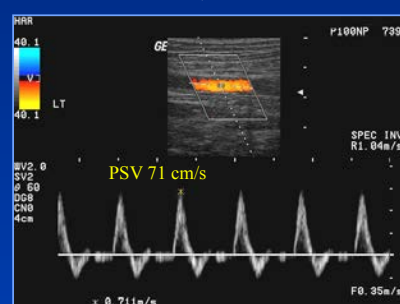
Pt. H, Rt. prox SFA



From: Techniques in Noninvasive Vascular Diagnosis-4th Ed. Summer Publishing, LLC. Copyright 2014 Robert Dargatzis

Femoro-popliteal segment

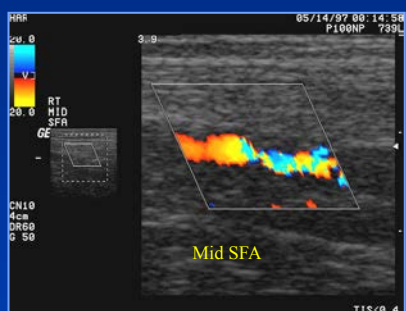
Pt. H, Lt SFA



From: Techniques in Noninvasive Vascular Diagnosis-4th Ed. Summer Publishing, LLC. Copyright 2014 Robert Dargatzis

Femoro-popliteal segment

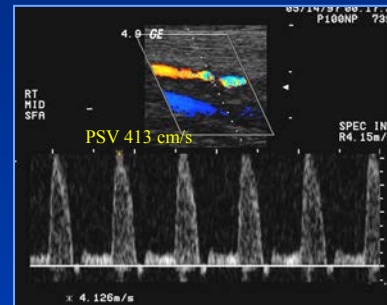
Pt. H, RT SFA Stenosis



From: Techniques in Noninvasive Vascular Diagnosis-4th Ed. Summer Publishing, LLC. Copyright 2014 Robert Dargatzis

Femoro-popliteal segment

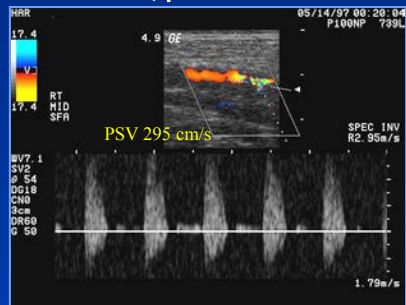
Pt. H, Rt SFA Stenosis



From: Techniques in Noninvasive Vascular Diagnosis-4th Ed. Summer Publishing, LLC. Copyright 2014 Robert Dargatzis

Femoro-popliteal segment

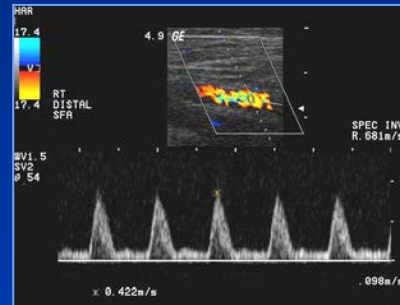
Pt. H, post stenosis



From: Techniques in Noninvasive Vascular Diagnosis-4th Ed. Summer Publishing, LLC. Copyright 2014 Robert Dargatzis

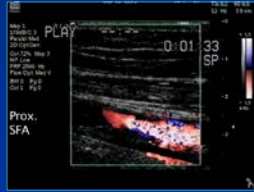
Femoro-popliteal segment

Pt. H, Distal Rt SFA



From: Techniques in Noninvasive Vascular Diagnosis-4th Ed. Summer Publishing, LLC. Copyright 2014 Robert Dargatzis

## SFA Stenosis



Click link while in PowerPoint Show  
<http://youtu.be/0BzaKdohcQw>

dubbed

50-70% sfa-dubbed.sm.wmv

From: Techniques in Noninvasive Vascular Diagnosis-4<sup>th</sup> Ed. Summer Publishing, LLC. Copyright 2014 Robert Dargatzis

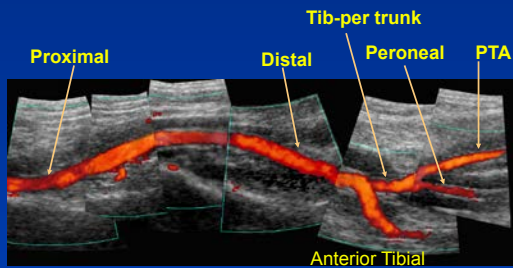
## Popliteal Segment

- Scan with leg externally rotated or with patient prone
- Obtain spectral waveforms. measure PSV
- Overlap SFA in adductor canal



From: Techniques in Noninvasive Vascular Diagnosis-4<sup>th</sup> Ed. Summer Publishing, LLC. Copyright 2014 Robert Dargatzis

## Popliteal Artery Power Doppler composite



From: Techniques in Noninvasive Vascular Diagnosis-4<sup>th</sup> Ed. Summer Publishing, LLC. Copyright 2014 Robert Dargatzis

## Stenosis Criteria

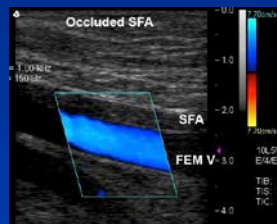
% Stenosis	Peak Vel	Velocity Ratio
Normal	< 150 cm/s	< 1.5 : 1
30- 49%	150- 200 cm/s	1.5:1 - 2:1
50 - 75%	200- 400 cm/s	2:1- 4:1
>75%	> 400 cm/s	>4:1
Occlusion	No color saturation	

Cosman DV, Ellison JE, et al.  
 Comparison of contrast angiography to arterial mapping  
 with color flow duplex imaging in the lower extremities.  
 J Vasc Surg 1989;10:522-32

From: Techniques in Noninvasive Vascular Diagnosis-4<sup>th</sup> Ed. Summer Publishing, LLC. Copyright 2014 Robert Dargatzis

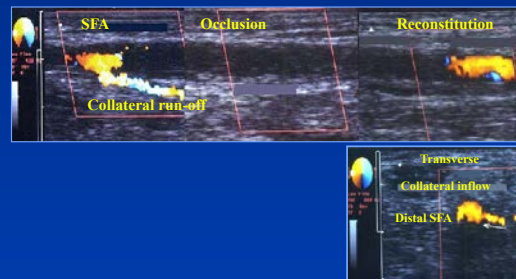
## Occlusion

- If artery is chronically occluded, locate it by it's proximity to the vein



From: Techniques in Noninvasive Vascular Diagnosis-4<sup>th</sup> Ed. Summer Publishing, LLC. Copyright 2014 Robert Dargatzis

## Composite SFA Occlusion



From: Techniques in Noninvasive Vascular Diagnosis-4<sup>th</sup> Ed. Summer Publishing, LLC. Copyright 2014 Robert Dargatzis

## Occlusion Criteria

- No flow in artery by color and spectral Doppler
- Identify collateral run-off
- Identify distal reconstitution

From: Techniques in Noninvasive Vascular Diagnosis-4th Ed. Summer Publishing, LLC. Copyright 2014 Robert Dagle

## Helpful Hints:

- The major arteries lie right beside the major deep veins, so use the veins as landmarks in the event the arteries are occluded.
- Long-standing occluded vessels are often contracted and difficult to identify. To be certain an artery is occluded you have to identify it.

From: Techniques in Noninvasive Vascular Diagnosis-4th Ed. Summer Publishing, LLC. Copyright 2014 Robert Dagle

## Helpful Hints:

- Use the length of the linear transducer face ( 4 cm) as a "rough" ruler to measure occlusion distances that are longer than the image field of view.

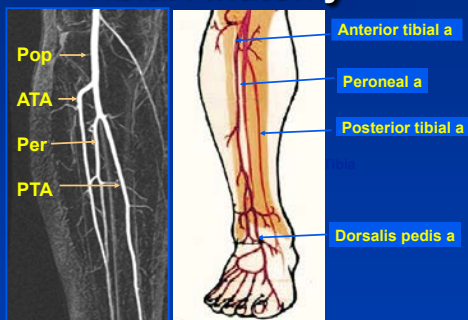
From: Techniques in Noninvasive Vascular Diagnosis-4th Ed. Summer Publishing, LLC. Copyright 2014 Robert Dagle

## Helpful Hints:

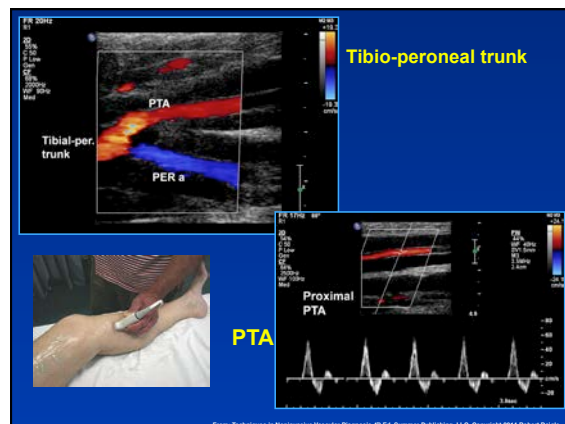
- Be aware that blood flow can reverse direction in an artery, as there are no valves. This can occur in the presence of more proximal occlusion, eg., retrograde flow in the PFA supplying SFA with CFA severe stenosis or occlusion

From: Techniques in Noninvasive Vascular Diagnosis-4th Ed. Summer Publishing, LLC. Copyright 2014 Robert Dagle

## Tibial Anatomy



From: Techniques in Noninvasive Vascular Diagnosis-4th Ed. Summer Publishing, LLC. Copyright 2014 Robert Dagle

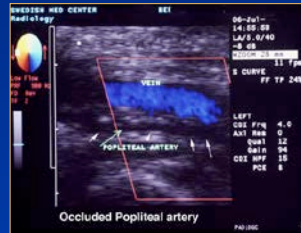


From: Techniques in Noninvasive Vascular Diagnosis-4th Ed. Summer Publishing, LLC. Copyright 2014 Robert Dagle



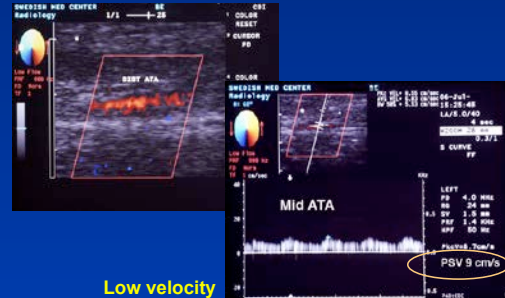
## Patient. AB

- Occluded Fem-popliteal graft.
- Occluded Pop. Artery.
- Occluded peroneal artery.



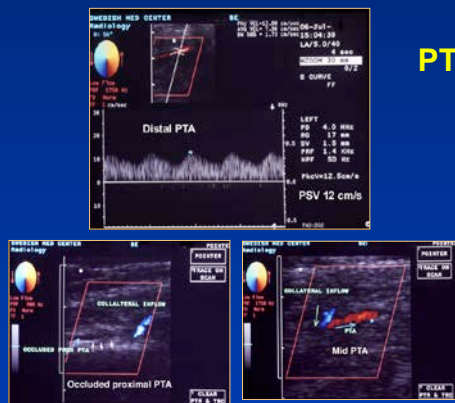
From: Techniques in Noninvasive Vascular Diagnosis-4th Ed. Summer Publishing, LLC. Copyright 2014 Robert Dagle

## Anterior Tibial Artery



From: Techniques in Noninvasive Vascular Diagnosis-4th Ed. Summer Publishing, LLC. Copyright 2014 Robert Dagle

## PTA



From: Techniques in Noninvasive Vascular Diagnosis-4th Ed. Summer Publishing, LLC. Copyright 2014 Robert Dagle

## Color Duplex Tips

- Learn anatomy on normals
- Allow sufficient time (reduce stress)
- Do not become excessively compulsive with stenosis versus occlusion in SFA
- Define your imaging goals

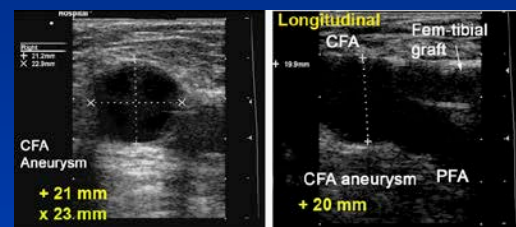
From: Techniques in Noninvasive Vascular Diagnosis-4th Ed. Summer Publishing, LLC. Copyright 2014 Robert Dagle

## Aneurysms

- Aorta
- Iliacs
- Infrainguinal
  - CFA
  - Popliteal
  - Vein graft bypass

From: Techniques in Noninvasive Vascular Diagnosis-4th Ed. Summer Publishing, LLC. Copyright 2014 Robert Dagle

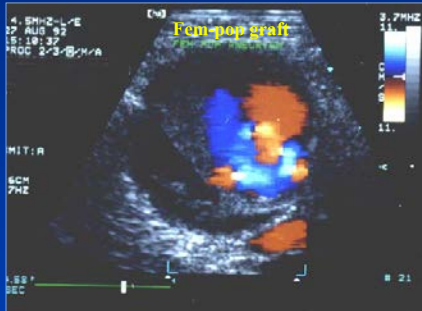
## Aneurysms can occur in iliacs and CFA



CFA

From: Techniques in Noninvasive Vascular Diagnosis-4th Ed. Summer Publishing, LLC. Copyright 2014 Robert Dagle

## Vein Graft Aneurysm



From: Techniques in Noninvasive Vascular Diagnosis-4th Ed. Summer Publishing, LLC. Copyright 2014 Robert Dargatzis

## Popliteal Artery Aneurysm

- **Atherosclerotic**
- **Risks**
  - Thrombosis
  - Emboli
  - Venous/nerve compression
  - Rupture
  - More frequent in men

From: Techniques in Noninvasive Vascular Diagnosis-4th Ed. Summer Publishing, LLC. Copyright 2014 Robert Dargatzis

## Popliteal Aneurysm

- **If thrombosed, 40-75% amputation rate**
- **Usually bilateral (in 50-70 % of patients)**
- **Likelihood of AAA is 43 %**

From: Techniques in Noninvasive Vascular Diagnosis-4th Ed. Summer Publishing, LLC. Copyright 2014 Robert Dargatzis

## Symptoms

- **Claudication**
- **Rest pain**
- **Limb ischemia**
- **Blue toe**
- **Nerve compression /pain**

From: Techniques in Noninvasive Vascular Diagnosis-4th Ed. Summer Publishing, LLC. Copyright 2014 Robert Dargatzis

## Embolic symptom - Blue Toe Syndrome



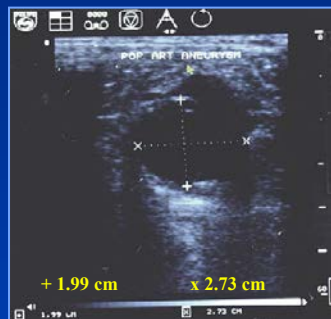
From: Techniques in Noninvasive Vascular Diagnosis-4th Ed. Summer Publishing, LLC. Copyright 2014 Robert Dargatzis

## Popliteal Aneurysm Method

- **In all aneurysms, measure the anterior-posterior and the lateral dimensions.**
- **Measure the length.**
- **Identify if thrombus is present.**
- **Identify if the artery is occluded or patent.**
- **Measure the diameter of the distal segment to determine if it is normal size (important preoperative information).**

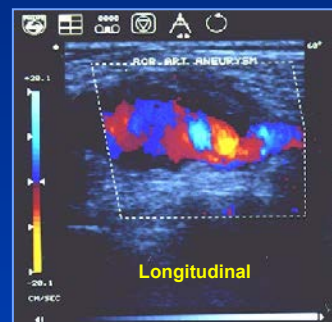
From: Techniques in Noninvasive Vascular Diagnosis-4th Ed. Summer Publishing, LLC. Copyright 2014 Robert Dargatzis

## Popliteal Artery Aneurysm



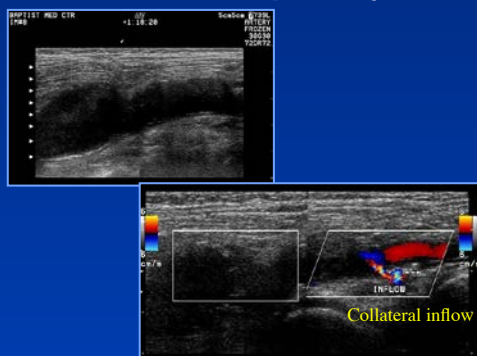
From: Techniques in Noninvasive Vascular Diagnosis-4th Ed. Summer Publishing, LLC. Copyright 2014 Robert Dargatzis

## Popliteal Aneurysm



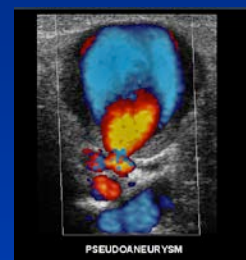
From: Techniques in Noninvasive Vascular Diagnosis-4th Ed. Summer Publishing, LLC. Copyright 2014 Robert Dargatzis

## Thrombosed Pop- aneurysm



From: Techniques in Noninvasive Vascular Diagnosis-4th Ed. Summer Publishing, LLC. Copyright 2014 Robert Dargatzis

## Duplex Evaluation of Pseudoaneurysm



From: Technis

## Pseudoaneurysm

- High-pressure extravasation of blood into surrounding tissue
- No arterial wall encapsulating aneurysm
- "to and fro" flow in aneurysm neck



From: Techniques in Noninvasive Vascular Diagnosis-4th Ed. Summer Publishing, LLC. Copyright 2014 Robert Dargatzis

## Pseudoaneurysm Etiology

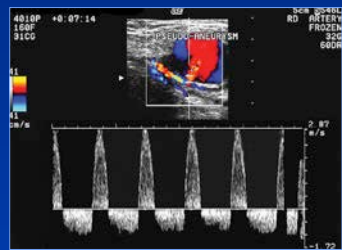
- Percutaneous arterial catheterization
- Penetrating trauma
- Graft anastomosis "blowout"



From: Techniques in Noninvasive Vascular Diagnosis-4th Ed. Summer Publishing, LLC. Copyright 2014 Robert Dargatzis

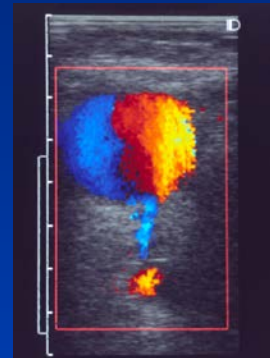
## SFA P-aneurysm "Neck"

"To and fro" flow in aneurysm neck is a characteristic.



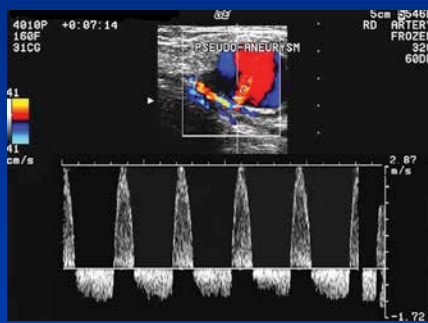
From: Techniques in Noninvasive Vascular Diagnosis-4<sup>th</sup> Ed. Summer Publishing, LLC. Copyright 2014 Robert Dargatzis

- Pseudo-aneurysm
- Long "neck" = no tear



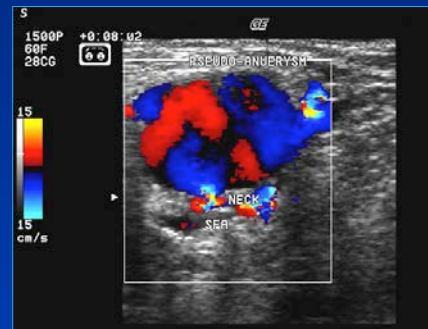
From: Techniques in Noninvasive Vascular Diagnosis-4<sup>th</sup> Ed. Summer Publishing, LLC. Copyright 2014 Robert Dargatzis

## P-aneurysm "Neck"

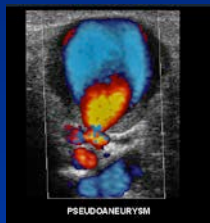


From: Techniques in Noninvasive Vascular Diagnosis-4<sup>th</sup> Ed. Summer Publishing, LLC. Copyright 2014 Robert Dargatzis

## Pseudoaneurysm - Transverse



From: Techniques in Noninvasive Vascular Diagnosis-4<sup>th</sup> Ed. Summer Publishing, LLC. Copyright 2014 Robert Dargatzis



Click this link in Powerpoint Show for pseudoaneurysm demo

[http://youtu.be/6Rwml4hl6\\_I](http://youtu.be/6Rwml4hl6_I)

Movie-dubbed.

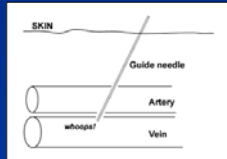
From: Techniques in Noninvasive Vascular Diagnosis-4<sup>th</sup> Ed. Summer Publishing, LLC. Copyright 2014 Robert Dargatzis

## Diagnostic Method

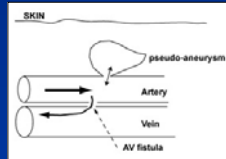
- Identify "neck" of aneurysm
  - to & fro flow?
- Is the artery torn?
- Is there extrinsic compression of the artery by the P-aneurysm?
- Measure size

From: Techniques in Noninvasive Vascular Diagnosis-4<sup>th</sup> Ed. Summer Publishing, LLC. Copyright 2014 Robert Dargatzis

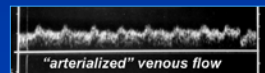
## Check Vein for Fistula Flow



Catheterization



Complications:  
P-aneurysm and AV fistula



From: Techniques in Noninvasive Vascular Diagnosis-4<sup>th</sup> Ed. Summer Publishing, LLC. Copyright 2014 Robert Dargatzis

## Pseudoaneurysm

- **60% thrombose spontaneously**
- **Treatment:**
  - Surgical repair
  - Manual compression with CDI
  - Thrombin injection

From: Techniques in Noninvasive Vascular Diagnosis-4<sup>th</sup> Ed. Summer Publishing, LLC. Copyright 2014 Robert Dargatzis

## Pseudoaneurysm Compression Repair.

- **Heparin DC 2 hrs prior, resumed 4 hours post**
- **Intravenous analgesic (narcotic)**
- **15-20 min compressions**
- **Monitor distal perfusion**
- **Bed rest for 6 hours post**

From: Techniques in Noninvasive Vascular Diagnosis-4<sup>th</sup> Ed. Summer Publishing, LLC. Copyright 2014 Robert Dargatzis

### Treatment with Manual compression.

Feld R., et.al., Treatment of iatrogenic femoral artery injury with US guided compression.  
J Vasc Surg 1992; 16:882-840

### Treatment with Thrombin injection:

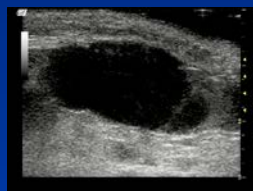
Kang S, Labropoulos N, et.al., Percutaneous US guided thrombin injection, a new method for treating ...  
J Vasc Surg 1998;27:1032-1038

### Treatment with Thrombin injection:

Pezzullo JA, et. al., Percutaneous injection of thrombin for the treatment of pseudoaneurysm...  
AJR 2000;175:1035-1040

From: Techniques in Noninvasive Vascular Diagnosis-4<sup>th</sup> Ed. Summer Publishing, LLC. Copyright 2014 Robert Dargatzis

## Demo of Thrombin injection for obliteration of Pseudoaneurysm



Click this link in Powerpoint Show for  
pseudoaneurysm demo

<http://youtu.be/DosQx1VnnVQ>

Movie Courtesy of Mr. Billy Zang

From: Techniques in Noninvasive Vascular Diagnosis-4<sup>th</sup> Ed. Summer Publishing, LLC. Copyright 2014 Robert Dargatzis