LOWER EXTREMITY VENOUS COMPRESSION ULTRASOUND

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Learning Objectives

• Setup and patient positioning for optimizing success

• Describe and recognize normal lower extremity vascular anatomy

• Determine the three locations to scan to rule out DVT in the ED

• Perform adequate compression to determine clot presence

• Determine whether a clot is old or new
Anatomy

Deep Veins
- Iliac
- Common Femoral
- (Superficial) Femoral
- Deep Femoral
- Popliteal
- Anterior Tibial
- Posterior Tibial
- Peroneal Veins

Superficial Veins
- Greater Saphenous
- Short Saphenous
- Perforating Veins
Deep Veins of Concern
Deep Veins of Concern

- CFV
- GSV
- DFV
- SFV/FV
- Pop. V
- ATV
- Peroneal V
- Trifurcation (calf)
- PTV

1 - 3 cm

6-8 cm
Sapheno-Femoral Junction

Right Leg
Left Leg GSV + CFV

Medial

Lateral

GSV
CFV
CFA

Left Leg
Bifurcation: CFV → SFV and DFV

Left Leg

Left leg: 1 – 3 cm distal to GSV junction
Popliteal Fossa

Orientation

Skin

PV

PA
Popliteal Vein
The Setup

- **US basics**
  - Right exam
  - Right depth
  - Right gain

- **Right probe**
  - High frequency (10-5 MHz)
  - *May need to use a curvilinear (lower frequency) probe in larger individuals for adequate depth assessment*
The Setup – Patient Positioning

- Semi-upright to upright
- Reverse trendelenberg to maximize vein size
- External hip rotation
- Partially flex knee
- Remove undergarments
Setup - Popliteal Imaging Options

- Supine or Sitting
  - Knee bent
  - Leg hanging over the side of bed
- Prone position
  - Easiest for scanner
  - Often hardest for patient
Technique

- Compression of 3 branch points starting in the inguinal ligament down to the trifurcation of the popliteal vein
  - Greater Saphenous Vein – Common Femoral Vein
  - Common Femoral Vein bifurcation
    - Deep Femoral Vein (DFV)
    - Superficial Femoral Vein (SFV)
      - * SFV aka “femoral vein” can be tracked to the distal 1/3 of the thigh where it disappears at the adductor hiatus.
  - Popliteal Vein trifurcation
    - Posterior tibial vein
    - Anterior tibial vein
    - Peroneal vein
Compression Ultrasound

- Optimal Image
  - Scan in transverse plane
  - Probe position perpendicular to skin

Left Leg
Compression Ultrasound

- Apply enough pressure to completely collapse the vein
- Be able to still identify artery pulsating
Capturing and Saving Images

- **Static: Dual screen image capture**
  - One side shows non-compressed view
  - Second screen shows compression view
  - Only method if there is no way to save clips

- **Dynamic: Video clips**
  - Capture area of interest without and with compression
  - Typically 6 second clips on most machines
  - Best method for documentation & review
  - Recommended if possible
Pitfalls & Anatomic Variants

• Lymph nodes

• Baker’s cyst

• Duplicate veins
Lymph Nodes
Baker’s Cyst
Duplicate Veins

Duplicate femoral and popliteal veins occur in 20-30% of patients
A Few Cases
DVT: Popliteal Vein

Noncompressible vein
DVT: Popliteal Vein
Common Femoral Vein

Medial

Noncompressible vein

Lateral
DVT
DVT
Applicable to the ED Physician

- (Non) Availability of sonographers and radiologists
- Fast and reliable diagnostic tool
- Supported by ACEP and Medical Literature
- ACEP Policy Statement (page 50-55)
  - ...specific attention directed towards key sections of the common femoral, femoral, deep femoral and popliteal veins. These sections constitute two short regions of the lower extremity, the inguinal region and popliteal fossa.
  - ...Color flow and Doppler assessment may be used to localize the vessels, although the use of this technology is beyond the scope of the standard EUS exam. Additionally, data suggest color and power Doppler adds little in ruling out DVT.
Applicable to the ED Physician

- Systematic review of six studies
  - Total of 132 DVTs in 936 patients
  - Pooled sensitivity and specificity of 95% and 96%, respectively.
  - More rapid disposition for patients undergoing bedside ED ultrasound compared with radiology department DVT assessment (95 vs. 225 minutes)

Summary

• Compress hard in short axis, maintaining transverse plane
• Focus on the simplified anatomy
• Beware of lymph nodes, baker’s cysts, and duplicate veins
• ACEP policy
  • 3 point compression (GSV-CFV, DFV-SFV, Pop-trifurcation)
  • No augmentation and no duplex required