Invasive Imaging in Venous Disease

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Disclosures

• None
Q/A: Do you perform IVUS in your practice?

A. Yes
B. No
“There is Nothing Else We Can Do”

• When to evaluate for iliac obstruction?
• New patients:
  • Signs and Symptoms Venous claudication
  • Skin changes / Ulceration / Diffuse limb pain / Swelling (CEAP 3-6) [next sessions on CEAP and patient selection]
  • DVT history
  • IVC filter history
  • Symptoms do not correlate with US findings
  • Pain & swelling out of proportion to findings
  • Pelvic surgery, radiation, trauma
• Previously treated patients:
  • Continued symptoms post superficial treatment
  • New symptoms without superficial venous abnormalities
  • NEW or non-healing ulcers
My Algorithm:

Patient with CVI

Mild disease C1/C2

Medical Rx sclerotherapy

Moderate/severe disease C2-C6

Duplex ultrasound ± Plethysmography

Reflex

Obstruction

Venography → IVUS

Superficial

Superficial + perforator ± deep

Saphenous vein ablation ± phlebectomy/sclerotherapy

vein ablation ± phlebectomy

Deep

PTA + stent Bypass graft
What are our options for venous imaging?

• Non-invasive... previously discussed.

• Invasive
  • Venography
  • Intra-vascular Ultrasound (IVUS)
Non-Invasive Imaging

• Pro’s:
  • US is Gold standard for superficial reflux.
  • For the deep system, from GSV junction down US is a great to identify DVTs and other abnormalities.
  • * I (and my US techs) use US to look at veins in the leg and most of the time I am correct BUT once in a while we do find a clot or obstruction in femoral or popliteal using IVUS that we didn’t see on US.
  • This makes me wonder how many other old clots are we missing?
Non-invasive Imaging

• Con’s:
  
  • Transpelvic/transabdominal US for iliac evaluation:
    • Very operator dependent and I find it limited in our larger “American” population.
    • ...patient size, bowel gas, depth of penetration, patient comfort, ....
  
  • Ultrasound is the most operator dependent technique. Rigorous training and experience are necessary. - Labropoulos N, et al. J Vasc Surg 2007;46:101-7

  • Venous phase contrast CT:
    • need to work out a protocol with a local imaging center
    • Radiation dose and contrast reactions
    • Reading radiologist interpretation – usually missed diagnosis until I call them back and they addendum (no hard feelings I’m a radiologist and I know how many cases they read)
    • Case of Mr Harry – AVF by mistake arterial phase was done.
    • Case of Mr David – Chronic MTS (next)

• Venous MRI:
  • Similar limitations as compared to CT... Contrast reactions, protocols...
  • Additionally patients are claustrophobic and tend to move around limiting the study.

• Remember: All standard diagnostic studies have limitations in the deep and pelvic venous system
• If I have a strong suspicion of deep vein obstruction I will go directly to IVUS and not Iliac vein US because if its negative I will still perform IVUS and takes me about the same time to perform.
Left sided abdominal pain, CEAP 5 left, CEAP 4 right, Hx DVT
Invasive Imaging

• PRO’s:
  • Improved sensitivity and specificity as compared to non-invasive imaging modalities
  • Gets the diagnosis more often

• CON’s:
  • Invasive procedure, potential for complications
  • More patient discomfort
  • Sedation if performing intervention
Venography and Intravascular Ultrasound (IVUS)

• Catheter based venography is currently considered the gold standard investigation to establish the diagnosis and guide interventional procedures in venous diseases

• However it has significant limitations!

• Venography many times leads to an under-estimation of the severity and extent of disease
Is Venography Alone Adequate to Evaluate the Deep Veins or do You Need IVUS?

• The poor diagnostic sensitivity of venography has been described in literature¹

• Venograms have been considered normal in 25% of limbs where IVUS showed >50% narrowing.

• Data suggests that 30-50% of cases can be missed if only frontal projection venograms are utilized²

• Raju & Neglén observed collaterals in only 43% of limbs [that were stented]³

• In my opinion you need IVUS in conjunction with venography.

• IVUS sensitivity in detecting obstruction is > 90%

• IVUS is superior in showing intraluminal details such as trabeculations and webs

• Crucial in guiding stent placement

May-Thurner

anteroposterior  60° rotation

Iliac vein
right common iliac artery
What do you think about this case?

<table>
<thead>
<tr>
<th>Option</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Grossly abnormal top to bottom !!!</td>
<td>20%</td>
</tr>
<tr>
<td>B. Grossly abnormal focally !</td>
<td>20%</td>
</tr>
<tr>
<td>C. Can I get another view?</td>
<td>20%</td>
</tr>
<tr>
<td>D. Humm... looks normal. Time for coffee!</td>
<td>20%</td>
</tr>
<tr>
<td>E. Can I phone a friend who does IVUS?</td>
<td>20%</td>
</tr>
</tbody>
</table>
• **Rokitanski Stenosis**

• Measurement must be made to normal reference of CIV 200 mm² as no normal segment to measure

• Area on IVUS = 68 mm²

• 66% stenosis when compared to expected anatomical measurement of 200 mm²

Reference sizes

• Common Iliac Vein (16mm) 200mm²

• External Iliac Vein (14mm) 150mm²

• Common Femoral Vein (12mm) 125mm²
IVUS

- Allows you to assess true extent of disease
- Allows for intraluminal evaluation of disease
- Provides excellent perivascular anatomic imaging
- Allows for precise stent sizing
- Helps with guidance during intervention
- Verifies results of treatment – Adequate coverage of all disease – Wall apposition, stent overlap
Using IVUS Guidance in Deep Venous Diagnosis

For diagnosis:
1. Femoral, popliteal or GSV venous access
2. Place 8F sheath
3. Wire placement (bilateral)
4. Perform venogram of leg from access point to the level of the diaphragm (optional – no radiation if wires bilateral and no problem with wire placement)
5. Advancement of IVUS catheter
6. IVUS pullback for branch identification starting with the renal veins
7. Remove wire and sheath, hold pressure.

Our average time of diagnostic procedure 20 min.

60mm Maximum Field of View (PV .035), 360° Real-time Intravascular View
May-Thurner and Other Areas of Compression
AKA: Non-Thrombotic Iliac Vein Lesions (NIVL)
Cases
May-Thurner and Other Areas of Compression
AKA: Non-Thrombotic Iliac Vein Lesions (NIVL)
May-Thurner and Other Areas of Compression
AKA: Non-Thrombotic Iliac Vein Lesions (NIVL)

Gray's Anatomy 1918 Edition

The Vein Center at Water's Edge Dermatology
Summary

• Venous obstruction is under-detected and underestimated.

• You must have a high clinical suspicion and utilize all available invasive and non-invasive techniques for evaluation based on patient’s presentation.

• When a patient with the appropriate CEAP score or history presents think of obstruction not just reflux.
References


Kiteboarding in Bali
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