Complete Evaluation of the Chronic Venous Patient:
Recognizing deep venous obstruction

Erin H. Murphy, MD
Rane Center
Disclosure

Speaker name: Erin H. Murphy

I have the following potential conflicts of interest to report:

- **X** Consulting: Medtronic, Boston Scientific, Cook Medical
- Employment in industry
- Stockholder of a healthcare company
- Owner of a healthcare company
- Other(s)

- I do not have any potential conflict of interest
Technical Aspects

Ablations / Phelbectomy

Acute DVT

Iliac Stenting

Recanalization
Underlying Pathology

Understand the evaluation process
Identify pathology and whether it is contributing to disease
Diagnostic Evaluation

• History and Physical Exam:
  • Elucidate symptoms and severity – Affect ADLs? Just want assurance?
  • Rule out other non-venous causes of symptoms

• Diagnostic Imaging Tests
  • Diagnose pathology
  • Guide procedural decisions
  • Manage patient expectations
  • Manage postoperative care
CEAP – Objective Characterization CVD

CEAP classification and description

1. Clinical classification
- C₀: No visible or palpable signs of venous disease
- C₁: Telangiectases or reticular veins
- C₂: Varicose veins
- C₃: Edema
- C₄a: Pigmentation and/or eczema
- C₄b: Lipodermatosclerosis and/or atrophy
- C₅: Healed venous ulcer
- C₆: Active venous ulcer
- C₇: Symptoms, including ache, pain, tightness, skin irritation, heaviness, muscle cramps, as well as other complaints attributable to venous dysfunction
- C₈: Asymptomatic

2. Etiologic classification
- Eᴄ: Congenital
- Eₚ: Primary
- Eₛ: Secondary (postthrombotic)
- Eₙ: No venous etiology identified

3. Anatomic classification
- Aₛ: Superficial veins
- Aₚ: Perforator veins
- Aₐ: Deep veins
- Aₙ: No venous location identified

4. Pathophysiologic classification
- Pᵣ: Reflux
- Pₒ: Obstruction
- Pᵣₒ: Reflux and obstruction
- Pₙ: No venous pathophysiology identifiable
CEAP classification and description

1. Clinical classification

- C₄a: Pigmentation and/or eczema
- C₄b: Lipodermatosclerosis and/or atrophy
- C₅: Healed venous ulcer
- C₆: Active venous ulcer
- Cₛ: Symptoms, including ache, pain, tightness, skin irritation, heaviness, muscle cramps, as well as other complaints attributable to venous dysfunction
- Cₐ: Asymptomatic

2. Etiologic classification

- Eₖ: Congenital
- Eₚ: Primary

3. Pathophysiologic classification

- Aₚ: Perforator veins
- A₉: Deep veins
- Aₙ: No venous location identified

- Pₗ: Reflux
- P₉: Obstruction
- Pₙ: Reflux and obstruction
- Pₙ: No venous pathophysiology identifiable
Clinical CEAP 1

- **C1**: Telangiectasia
- Always Primary and Superficial
- **Work-up**: Focused History and Physical only
- Symptomatic? Desire treatment?

Local procedures:
Sclerotherapy
Clinical CEAP 2

- **C2** – Varicose veins
- **Etiology** – Primary or Secondary
- **Anatomy** – Superficial
- **Pathology** – Reflux > Obstruction

- Asymptomatic (+/-) compression: no w/u

- **Symptomatic & desires intervention:**
  - Phlebectomy, Sclero, Ablation
  - Duplex US: Superficial Reflux
Clinical CEAP 3 - 6

EVALUATE FOR REFLUX & VENOUS OBSTRUCTIVE DISEASE

CEAP 3: Edema
CEAP 4: Hyperpigmentation and Lipodermatosclerosis
CEAR 5: Healed Ulcers
CEAP 6: Active Ulcers
Spectrum of Chronic Venous Disease

Advanced C3-C6 Disease
Majority have obstructive component!!!

Primary - NIVLs
May Thurner Disease

Secondary
Post-thrombotic
CEAP 3: Proper Selection

- **QOL: Is this lifestyle limiting?**
  - Do not treat benign edema manageable with compression
  - Interference with ADLs: walking, shopping, family

- **Evaluate: All edema is not venous**

- **Co-existing medical conditions** (or risk overtreatment and poor results with risk): CHF, COPD, sleep apnea, morbid obesity, nephrotic syndrome, Ca2+ channel blockers

- **Set Expectations:** May improve but not resolve

- **Monitor Outcomes:** We need more information
IMPORTANT!! Lymphedema patients often have deep venous obstruction!! Can be SECONDARY to venous obstruction!

Lymphangiogram results may surprise you & be normal! Or + but patients still improve with stent!

Set expectations: Pain > swelling, ? how much swelling will improve

Guide postoperative care: Lymphatic Therapy, Pumps
Alternative Presentation of CVD: Lymphedema

Pre-Area CIV 86

Pre-Area EIV 76
Alternative Presentation of CVD: Lymphedema
Alternative Presentation: Recurrent Cellulitis

- Can be associated with venous obstruction / lymphedema
- Often not cellulitis but venous skin changes and/or allergic reactions to topicals
- Venous and Lymphatic disorders cause breakdown of the normal dermal barrier and skin becomes reactive
- LOOK FOR VENOUS DISEASE
Think about other causes of lower extremity ulceration before jumping to venous interventions: arterial, diabetic, CT disorders, vasculitis, sickle cell, cancers

Weigh your findings with venous ulcers:

- Localized medial maleolar disease with large refluxing GSV may be related to superficial reflux – ok to treat this first
- Extensive or recurrent ulceration despite treatment of superficial reflux, minimal superficial disease → Think about obstruction and deep reflux
Diagnostic Testing: CEAP 3 – 6, lymphedema, recurrent cellulitis

- **Duplex Ultrasound:**
  - Superficial and deep reflux
  - Iliac Scan – Velocities and *Diameters*

- **Venography:** Transfemoral/Ascending venograms, CTA, MRV

- **Lymphangiogram:** Manage expectations and postoperative care
Limitations of Duplex Ultrasound

- Traditional DUS Criteria for Iliac Vein Stenosis:
  - Caliber change – discrete narrowing compared to adjacent segments
  - Velocity change – ratio in adjacent segments > 2.0

Stenosis: 40%

Stenosis: 40%

Stenosis: 60%
Limitations of Duplex Ultrasound

- **Rokitansky Stenosis:**
  - Diffuse long segment stenosis w/o focal narrowing
  - May be present in up to 50% of PTS patients
DUS Diameter/Area Criteria for Iliac Vein Stenosis:

- Diameter was obtained, area calculated using $\pi r^2$ at narrowest point in each segment (CFV, EIV, CIV, IVC)
- Degree of stenosis determined by comparing to standard anatomic *normals* for each location – NOT TO ADJACENT SEGMENTS

<table>
<thead>
<tr>
<th>Location</th>
<th>Diameter</th>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>CFV</td>
<td>D: 12mm</td>
<td>A: 113 mm$^2$</td>
</tr>
<tr>
<td>EIV</td>
<td>D: 14mm</td>
<td>A: 154 mm$^2$</td>
</tr>
<tr>
<td>CIV</td>
<td>D: 16mm</td>
<td>A: 201 mm$^2$</td>
</tr>
</tbody>
</table>
Limitations of Duplex Ultrasound

Normal velocity, no gradient

D: 9.4 mm = Area: 69 mm²
Stenosis: 55%

Area: 90 mm²
Stenosis: 53%
### Duplex Criteria in Native Veins

<table>
<thead>
<tr>
<th>Patients (n=86)</th>
<th>False +</th>
<th>False -</th>
<th>Specificity</th>
<th>Sensitivity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Traditional US Criteria</strong></td>
<td>1 (1%)</td>
<td>29 (34%)</td>
<td>92%</td>
<td>60%</td>
</tr>
<tr>
<td><strong>Modified duplex criteria</strong></td>
<td>9 (11%)</td>
<td>2 (2%)</td>
<td>31%</td>
<td>97%</td>
</tr>
</tbody>
</table>

*↑ Sensitivity = Improved screening test*
MRV Criteria for Iliac Vein Stenosis: Area calculated ($\pi r^2$) & compared to anatomic minimums

<table>
<thead>
<tr>
<th>Patients (n=22)</th>
<th>False +</th>
<th>False -</th>
<th>Specificity</th>
<th>Sensitivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>MRV</td>
<td>1 (5%)</td>
<td>1 (5%)</td>
<td>50%</td>
<td>95%</td>
</tr>
</tbody>
</table>
Intravascular Ultrasound

- Remains gold standard
- If duplex or venography suggest stenosis then IVUS is indicated
- Or if work-up negative and highly suspicious
Summary

- **CEAP 1:** Focused Exam without additional testing
- **CEAP 2:** Duplex US (Reflux)
- **CEAP 3-6:** Detailed H&P for other causes of edema/skin changes/ulceration
  - Duplex for Deep and Superficial Reflux
  - Iliac Scan with diameters
  - Venography – MRV/CTV/Traditional Venograms
  - Lymphangiogram – Consider
  - IVUS = Gold standard
Complete Evaluation of the Chronic Venous Patient:

Recognizing deep venous obstruction

Erin H. Murphy, MD
Rane Center