Ultrasound shows pathology in the superficial and deep veins. What to do?

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Disclosure

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• Research Grant: Angiodynamics, Covidien, Sapheon;
• Ownership Interest: Vascular Device Partners
Elements to Consider

C - Clinical state

E - Primary, Secondary Disease

A - Anatomic distribution (s,p,d)

P - Reflux, obstruction
Evaluation & Management of CVI

Patient with CVI

Mild disease C1/C2 → Medical Rx sclerotherapy

Moderate/severe disease C2–C6

Duplex ultrasound ± Plethysmography

Obstruction

Reflex

Superficial

Saphenous vein ablation ± phlebectomy / sclerotherapy

Superficial + perforator ± deep

Saphenous vein ablation ± phlebectomy + SEPS

Deep

Valvuloplasty

Valve transposition

Valve transplant

PTA + stent

Bypass graft
Why worry about deep veins?

1. Deep vein involvement harbinger of poor results
   present in < 20% of C2 cases
   present in > 70% of C5,6 cases

2. PTS: primarily affects deep veins
   present in > 40% of C5,6 cases
   present in < 15% of C2,3 cases

3. Opportunity for treating resistant problems

Courtesy Robert Kistner, MD
reflux
Where does venous reflux start?

- In the early stages of CVD
  - reflux usually involves the superficial veins
  - deep venous insufficiency (DVI) is uncommon.

Clinical correlation to various patterns of reflux.

- Prevalence of DVI increases as CVD worsens
- Combined superficial and deep venous reflux is seen with more severe CVD (classes C4-C6).

## Distribution of reflux in patients with venous ulcers - C6

<table>
<thead>
<tr>
<th></th>
<th>Labropoulos et al.(^{20})</th>
<th>Barwell et al.(^{142})</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(n = 112)</td>
<td>(n = 593)</td>
</tr>
<tr>
<td>Superficial (S)</td>
<td>23%</td>
<td>39%</td>
</tr>
<tr>
<td>Perforator (P)</td>
<td>3%</td>
<td></td>
</tr>
<tr>
<td>Deep (D)</td>
<td>6%</td>
<td>8%</td>
</tr>
<tr>
<td>S + P</td>
<td>21%</td>
<td></td>
</tr>
<tr>
<td>S + D</td>
<td>12%</td>
<td>43%</td>
</tr>
<tr>
<td>P + D</td>
<td>4%</td>
<td></td>
</tr>
<tr>
<td>S + P + D</td>
<td>28%</td>
<td></td>
</tr>
<tr>
<td>No reflux</td>
<td>4%</td>
<td>10%</td>
</tr>
<tr>
<td>Occlusion/PTS</td>
<td>2%</td>
<td></td>
</tr>
</tbody>
</table>

*Note: "mixed" indicates mixed reflux.*
In patients with class 5 and 6 disease, 27.5%\(^1\) to 22%\(^2\) of limbs with primary superficial venous reflux also displayed reflux in the deep system.


Overloading Circuit Hypothesis

Deep reflux is thought to be the result of dilatation due to volume overload through the perforators.

Reflux in the CFV and FV was associated with GSV incompetence.

Popliteal reflux was associated with SSV and GV incompetence.
deep venous reflux was eliminated with saphenectomy:
- 27 of 29 limbs (93%)³ and
- 16 of 17 limbs (94%)⁴

However, reflux involving the femoral and popliteal vein was more recalcitrant.


Puggioni A, Lurie F, Kistner RL, Eklof B.  
How often is deep venous reflux eliminated after saphenous vein ablation?  

Padberg FT Jr, Pappas PJ, Araki CT, Back TL, Hobson RW II.  
Hemodynamic and clinical improvement after superficial vein ablation in primary combined venous insufficiency with ulceration.  

Ting ACW, Cheng SWK, Wu LLH, Cheung GCY.  
Changes in venous hemodynamics after superficial venous surgery for mixed superficial and deep venous insufficiency.  

Adam DJ, Bello M, Hartshorne T, London NJ.  
Role of superficial venous surgery in patients with combined superficial and segmental deep reflux  

resolution of deep venous reflux after saphenectomy:  
32%5, 27%6, 28%7, 50%8
Calf pump can cope with additional load and reduce foot vein pressure during exercise by 40-70%
Calf Pump Does Not Compensate as Well With Multisystem Reflux

\[ S + D + P \Downarrow AVP \ 10-30\% \]

Burnand, AVF Handbook, 2001
Common Questions

1. GSV ablation in presence of deep axial reflux?

2. GSV ablation in patient with previous DVT?
DVI not a barrier to the safe and effective performance of endovenous laser (EVL) ablation for the GSV.

They found that VCSS improved, irrespective of the presence or absence of DVI.
patients treated with EVL ablation, experienced correction of venous filling index (VFI) and venous clinical severity score (VCSS) in most cases.

DVI in the femoral and/or popliteal veins were less likely to completely correct their VFI, than were those with isolated CFV reflux.

Maximum reflux velocity in the most distal refluxing deep vein, popliteal or femoral, was predictive of outcome after EVL as measured by VFI and VCSS.

Patients with femoral or popliteal maximum reflux velocities lower than 10 cm/sec usually experience marked improvement in VFI and VCSS.

Patients with femoral or popliteal reflux velocities greater than 10 cm/sec have a high incidence of persistent symptoms after EVL.
Reflux GSV: 1° Reflux FV

Rule: Ablate GSV first

* Decrease volume reflux easily
* Minimal chance of doing harm because no obstructive element

If recurrence:
1. Check perforators and treat.
2. Check deep valve, if candidate for repair.
obstruction
obstruction

femoro-popliteal

ileo-femoral
  primary (may-thurner)
  secondary (post-thrombotic)
Descending Venograms

- Competent valve
- Primary reflux
- Post-thrombotic reflux w/ obstruction
Kistner Valvuloplasty

fem-pop
Complex Deep Reconstruction

- Angioplasty/stent Iliac
- Endophlebectomy CFV/EI
- Transposition FV-GSV
- A-V Fistula in FV

Courtesy Robert Kistner, MD
Deep Venous Outflow Obstruction

AVP +/- 10%

Calf pump does NOT compensate well

PFV good outflow source

Burnand, AVF Handbook, 2001
Deep Venous Outflow Obstruction

FV & PFV occluded - GSV is sole outflow source

Rare - should be obvious from clinical presentation

AVP +/- 10%

Burnand, AVF Handbook, 2001
# Normal segmental vein outflow

<table>
<thead>
<tr>
<th></th>
<th>GSV—Fem—PFV</th>
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<tbody>
<tr>
<td>Normal</td>
<td>10—50—30</td>
</tr>
<tr>
<td>Obstruction</td>
<td>50—10—20</td>
</tr>
<tr>
<td>Reflux</td>
<td>20—30—30</td>
</tr>
</tbody>
</table>

- **GSV**: 50cc (10%)
- **PFV**: 150 cc (30%)
- **FV**: 250cc (50%)

*Courtesy Robert Kistner, MD*
Axial transformation of the profunda femoris vein
Venous outflow obstruction: An underestimated contributor to chronic venous disease

Peter Neglén, MD, PhD, Tara L. Thrasher, BS, and Seshadri Raju, MD, Jackson, Miss
Conclusion:

- Iliac venous stenting alone is sufficient to control symptoms in the majority of patients with combined outflow obstruction and deep reflux.
- Partial correction of the pathophysiology in limbs with multisystem or multilevel disease can provide substantial symptom relief.
- Open correction of obstruction or reflux is now required only infrequently as a “last resort”.

J Vasc Surg 2010;51:401-9
Conclusion:
• The single-stage is safe, gives excellent symptom relief, QOL, & good ulcer-healing rate.
• Logical to do multiple minimally invasive interventions rather than open surgery.
• Any associated deep reflux can initially be ignored pending clinical response.
Windy-Ipanema Valve Stent
Conclusion:

Deep reflux no worries
Deep obstruction-profundum femoris status key

Thank you!