Perforators: When to Treat and How Best to Do It?

Eric Hager, MD
September 10, 2015
• Cadaveric studies\textsuperscript{1} have shown >60 vein perforating veins from superficial to deep
• Normal flow is predominantly superficial to deep with primary function to drain venous flow from the skin
• Pathologic veins allow reversal of flow which inhibits venous drainage
Current Societal Guidelines

• SVS ulcer treatment guidelines consider perforating veins to be pathologic with > 500 ms reflux and a diameter > 3.5 mm (2C).

• It is suggested that these be closed by percutaneous methods rather than open surgery (1C)
Current Societal Guidelines

- Patients considered for perforator closure
  - CEAP 5; perforators in area of healed ulcer
  - CEAP 6; perforator in area of active ulcer
Endovenous ablation of incompetent perforating veins is effective treatment for recalcitrant venous ulcers

Peter F. Lawrence, MD, Ali Alktaifi, MD, David Rigberg, MD, Brian DeRubertis, MD, Hugh Gelabert, MD, and Juan Carlos Jimenez, MD, Los Angeles, Calif

• Majority of venous ulcers can be effectively treated with ablation of axial veins and compression therapy

• The presence of incompetent perforating veins (IPVs) can lead to recalcitrant ulceration
Why treat perforating veins?

The impact of ablation of incompetent superficial and perforator veins on ulcer healing rates

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• **Successful** ablation of IPVs reduces ulcer recurrence and facilitates healing
What this means in contemporary venous practice

- **Duplex Results:**
  - **GSV + perforator**
    - GSV ablation first will restore normal flow direction in 50% of pathologic perforating veins.
    - Treat residual pathologic perforating veins in patients with C5/C6 disease
  - **What about deep reflux?**
    - Does not *preclude* therapy of superficial reflux or ablation of pathologic perforating veins
What modalities are available?

• **Treatment options:**
  – Endovenous laser ablation (EVLA)
  – Radiofrequency ablation (RFA)
  – Ultrasound guided foam sclerotherapy (UGFS)
  – Subfascial endoscopic perforator surgery (SEPS)

• Percutaneous IPV closure rates range from 60-95%
Endovenous Laser Ablation

- 1470 nm, 400um microfiber introduced through direct puncture 21g needle
- Positioned 2-3 mm from the deep vein
- Lidocaine infiltrated around the laser tip
- The generator set at 6 watts and treated with 50-100 joules per 2mm
Retrospective analysis of 132 patients who underwent EVLA at a single institution from 2010 – 2011 and compared to conservative therapy

- 95 (72%) CEAP 6

Outcomes:
- Immediate procedural success was 100%
- 1 year closure rates were 82%
- Faster median ulcer healing rate was observed (1.4 mo vs 3.30 mo)
- No DVT / neuralgia
- EVLA is safe and effective and improves ulcer healing rates

Eur J Vasc Endovasc Surg. 2015 May;49(5):574-80.
Direct puncture and Seldinger technique both used

Positioned 2-3 mm from the deep vein

After local anesthesia infiltration, 4 quadrants treated for 30 seconds each

Catheter withdrawn 3-5 mm and treated again
Analysis of 75 patients who underwent perforator RFA

- 60 (80%) CEAP 6

Outcomes:

- Immediate procedural success was 94%
- 1 year closure rates were 82%
- CEAP and pathological clinical score improved in 49.3%
- No change in ulcer healing rate, but reduced recurrence rates (12% vs. 43%)
- 2 tibial vein DVT

Successful RFA improves CEAP class and pathologic clinical scores and reduces ulcer recurrence rates

Phlebology. 2010 Apr;25(2):79-84
Foam Sclerotherapy

- Communicating vein cannulated with a 23-gauge butterfly needle.
- One cc of 1% polidocanol (Asclera, Merz Aesthetics, Greensboro, NC) agitated with 4 cc room air
- 8 cc maximum foam injected
- Perforator completely filled, compression is held at the junction of the perforator and the deep vein for 2 minutes
- Efforts made to push foam into varicosities
62 patients with C6 disease

- 189 perforating veins treated with UGFS
  - Overall ablation success per injection was 54%
  - 70% healed with successful healed
  - 38% healed with failed ablation
  - P=.02
Subfascial endoscopic perforator surgery

- General anesthesia
- Perforating veins carefully mapped and marked
- Leg exsanguinated and 2x 10 mm Optiview ports placed (3 cm from tibial tuberosity)
- Subfascial space entered under direct visualization
- Perforating veins clipped and divided
SEPS - Supporting Literature

Retrospective analysis of 151 patients who underwent SEPS at 17 medical centers from 1993 – 1996
  – 104 (70%) CEAP 6

Outcomes:
  – Procedural success was 92%
    • VCSS improved from 9.4 to 2.9 (P<0.0001)
    • Ulcer healing rate was 88%

  • Wound infection 11%
  • Neuralgia 12%

296 perforators treated
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112 patients

EVLA
n = 62 (21%)

RFA
n = 93 (31%)

UGFS
n = 141 (48%)

Hager E, Washington C, Steinmetz A, Wu T, Singh MJ, Dillavou E. Factors that Influence Perforator Vein Closure Rates Using Radiofrequency Ablation, Laser Ablation or Foam Sclerotherapy. Accepted to JVS
## Patient Demographics

<table>
<thead>
<tr>
<th>Variable</th>
<th>EVLA (n=25)</th>
<th>RFA (n=49)</th>
<th>UGFS (n=48)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Age</td>
<td>60.7 ± 16.0</td>
<td>61.0 ± 13.0</td>
<td>61.3 ± 13.6</td>
<td>NS</td>
</tr>
<tr>
<td>Mean BMI</td>
<td>32.1 ± 10.2</td>
<td>34.3 ± 8.4</td>
<td>31.6 ± 8.2</td>
<td>NS</td>
</tr>
<tr>
<td>Deep vein reflux</td>
<td>7 (28%)</td>
<td>13 (33.3%)</td>
<td>16 (33.3%)</td>
<td>NS</td>
</tr>
<tr>
<td>Diuretic use</td>
<td>7 (28.0%)</td>
<td>11 (28.2%)</td>
<td>15 (31.3%)</td>
<td>NS</td>
</tr>
<tr>
<td>Anticoagulation</td>
<td>8 (32.0%)</td>
<td>13 (33.3%)</td>
<td>18 (37.5%)</td>
<td>NS</td>
</tr>
<tr>
<td>Diabetes</td>
<td>4 (16.0%)</td>
<td>5 (12.8%)</td>
<td>9 (18.8%)</td>
<td>NS</td>
</tr>
<tr>
<td>Congestive heart failure</td>
<td>4 (16.0%)</td>
<td>4 (10.3%)</td>
<td>3 (6.3%)</td>
<td>NS</td>
</tr>
<tr>
<td>Chronic obstructive pulmonary disease</td>
<td>4 (16.0%)</td>
<td>5 (12.8%)</td>
<td>2 (4.2%)</td>
<td>NS</td>
</tr>
</tbody>
</table>
## Perforator Characteristics

<table>
<thead>
<tr>
<th>Variable</th>
<th>EVLA (n=62)</th>
<th>RFA (n=93)</th>
<th>UGFS (n=141)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perforator size (mm)</td>
<td>4.9 ± 1.8</td>
<td>5.2 ± 1.5</td>
<td>4.0 ± 0.9</td>
<td>NS</td>
</tr>
<tr>
<td>Length &gt; 3 cm</td>
<td>15 (24.2%)</td>
<td>14 (15.1%)</td>
<td>27 (19.2%)</td>
<td>NS</td>
</tr>
<tr>
<td>Pulsatility</td>
<td>13 (21%)</td>
<td>31 (33.3%)</td>
<td>45 (31.9%)</td>
<td>NS</td>
</tr>
<tr>
<td>Prior GSV/SSV ablation</td>
<td>62 (100%)</td>
<td>88 (94.6%)</td>
<td>135 (95.7%)</td>
<td>NS</td>
</tr>
</tbody>
</table>
# Predictor of Success

<table>
<thead>
<tr>
<th>Modality of Second Procedure</th>
<th>Primary closure rates</th>
<th>Closure rates after prior UGFS</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>EVLA</td>
<td>61.3%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RFA</td>
<td>73.1%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>UGFS</td>
<td>57.4%</td>
<td></td>
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<tbody>
<tr>
<td>EVLA</td>
<td>61.3%</td>
<td>84.6%</td>
<td>.03</td>
</tr>
<tr>
<td>RFA</td>
<td>73.1%</td>
<td>89.1%</td>
<td>.003</td>
</tr>
<tr>
<td>UGFS</td>
<td>57.4%</td>
<td>50%</td>
<td>NS</td>
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</table>

Heat ablation after failed foam sclerotherapy resulted in significantly higher closure rates.
Predictors of failure

• All modalities:
  – BMI >50 (p=.05)
  – Pulsatility in the treated vein (p=.05)

• Variables that did not affect closure rates
  – Anticoagulation
  – Presence of deep vein reflux
  – Perforator size
  – BMI <50
Conclusions

1. Pathologic perforating veins can be the cause recalcitrant venous ulceration

2. Current societal guidelines recommend ablation of perforating veins in C5/C6 disease after GSV and SSV ablation

3. Successful perforator ablation leads to increased rates of ulcer healing and a reduction in recurrence rates in conjunction with compression therapy

4. Thermal ablation appears to have higher ablation rates than ultrasound guided foam sclerotherapy