How I do Endothermal Ablation for Venous Insufficiency

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- The Vein Institute of Toronto
- Scarborough Vascular Group
- Scarborough Vascular Ultrasound
- Scarborough Vascular Institute
- Toronto Endovascular Centre
- Scarborough Hospital
Disclosure

- Consultant:
  - Bard™ Canada
  - Boston Scientific ™ Canada
  - Edwards Life Sciences ™
  - Baylis™ Canada
  - Sigmacon ™
  - Diomed™
  - Dornier™
Objective: Remove the GSV from the Circulation

1. Surgical - HL & stripping
2. Chemical – sclerotherapy
3. Thermal – RF & Laser

Thermal ablation has emerged. Surgical stripping is no longer the gold-standard.
Invagination
stripping of LSV
Prospective randomized studies of recurrent VV after high ligation & stripping

<table>
<thead>
<tr>
<th>First author</th>
<th>Followup (mo)</th>
<th>Recurrent reflux</th>
<th>Recurrent varicosities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dwerryhouse⁵</td>
<td>60</td>
<td>15/52⁺</td>
<td>11/52</td>
</tr>
<tr>
<td>Sarin⁸</td>
<td>21</td>
<td>21/43⁺</td>
<td>15/43⁺</td>
</tr>
<tr>
<td>Rutgers¹³</td>
<td>36</td>
<td>10/69⁺</td>
<td>27/69⁺</td>
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<tr>
<td>Neglén¹⁶</td>
<td>60</td>
<td></td>
<td>30/74</td>
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<tr>
<td>Jakobsen³⁹</td>
<td>36</td>
<td></td>
<td>16/158⁺⁺</td>
</tr>
<tr>
<td>Munn⁴⁰</td>
<td>30–42</td>
<td></td>
<td>21/57⁺</td>
</tr>
</tbody>
</table>

(2 – 5 yrs) 28% 26%
Neovascularization at SFJ causes recurrence

Chaotic nest of new veins at SFJ reconstitute axial vein remnants downstream in the thigh

Van Rij, JVS 2004
Treatment Goals

- Ablate vein
- Avoid complications
  - DVT
  - Nerve injuries
  - Skin burns
- Minimize recurrence
Treatment Plan

- Understanding anatomy is key to successful outcomes
- Preprocedure US evaluation is critical in determining treatment plan
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Anatomy & Ultrasound
Compartments of the Thigh

SC, Superficial compartment; 
DC, deep compartment.
Great Saphenous Vein Anatomy

- Superficial Circumflex Iliac Vein
- Superficial Epigastric Vein
- Superficial External Pudendal Vein
- Anterior Lateral Tributary
- Posterior Medial Tributary
- Greater Saphenous Vein
- Anterior Tributary Vein
- Posterior Arch Vein
- Superficial circumflex iliac vein
- External pudendal vein
- Posterior accessory great saphenous vein
- Great saphenous vein
- Femoral/popliteal vein
- Posterior tibial vein
- Proximal paratibial perforating veins
- Posterior arch (Leonardo’s vein)
- Great saphenous vein
- Superficial epigastric vein
- Lateral
- Medial
Common Patterns of VV

GSV  Pudendal  Dodd  Giacomini
R.V. & S.V.

C1

C2

V.V.
Origin?

- Incompetent perforator reflux
- Thermal ablation is not the treatment of choice
- Treatment of GSV, SSV, etc is not indicated
Great Saphenous Vein Ultrasound
Saphenous Canal

LSV

SSV
Vein Entry
&
Catheter Position
Vein Entry

- Site of GSV entry is somewhat controversial
  - Knee level entry has lead to higher recurrence rates
  - Below knee entry may lead to parasthesias
- Site of SSV entry is typically mid calf
Vein Entry

- Is it just like a PICC line?
  - Beware of spasm
  - Calming environment
  - Warm environment
  - Reverse trendelenburg position
Micropuncture Kit
Leg Position & Vein Entry
Puncture & Sheath
Catheter Tip Position

- Start distal to SEV
  - Allows abdominal wall drainage into SFJ
  - No propagation of thrombus
  - No neovascularization
Catheter Tip Position - Ultrasound Image

- CFA
- SEV
- CFV
- SFJ
- Opened electrodes
- Catheter
Tumescent Anesthesia
Tumescent Anesthesia

Key to procedural success
- Heat sink
- Analgesia
- Compression of vein
- Displace adjacent structures

.05-.1% (.5-1gm/liter)
- 6-7mg/kg has been listed as max dose
- However liposuction studies have shown dosages of 35mg/kg have been safe
Tumescent Anesthesia
Tumescent Anesthesia
Tumescent Anesthesia
Radiofrequency Ablation
Closure® Procedure
(Radiofrequency)

- Catheter inserted in refluxing vein
- Catheter positioned, electrodes deployed
- RF energy heats and contracts vein wall
- Catheter slowly withdrawn, closing vein
- Denuded vein is physically narrowed
Resistive Heating-
direct contact with
vein wall

Impedance high >200
Heating = Temp 85 C
Animal Research: Acute histologic effects of RF heating.

- **Denude** endothelial lining
- **Contraction & thickening** of vein wall
- **Necrosis** of smooth muscle and vein wall components
- **Shrinkage** of collagen fibrils
Animal Research: Post Treatment Effects

- Extensive growth of fibroblasts
- New collagen synthesis
- Further thickening of vein wall
- Fibrous plug
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# 5-year registry data: RF ablation

<table>
<thead>
<tr>
<th></th>
<th>1 Year</th>
<th>2 Years</th>
<th>3 Years</th>
<th>4 Years</th>
<th>5 Years</th>
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</thead>
<tbody>
<tr>
<td>Absence of reflux</td>
<td>407/458</td>
<td>211/24</td>
<td>103/11</td>
<td>93/10</td>
<td>31/3</td>
</tr>
<tr>
<td></td>
<td>89%</td>
<td>88%</td>
<td>87%</td>
<td>87%</td>
<td>84%</td>
</tr>
<tr>
<td>Absence of varicose veins</td>
<td>360/458</td>
<td>191/24</td>
<td>99/119</td>
<td>81/10</td>
<td>29/3</td>
</tr>
<tr>
<td></td>
<td>79%</td>
<td>79%</td>
<td>83%</td>
<td>76%</td>
<td>78%</td>
</tr>
</tbody>
</table>

92% of limbs that are reflux-free at 1 year continue to be reflux free at subsequent follow-up (to 5 years)

Endovenous Laser Treatment

There are 4 FDA approved devices 810 nm, 940 nm, 980nm & 1320nm.
Endovenous Laser Position
Endovenous Laser Energy Deposition

- **Objectives:**
  - Adequate Energy Deposition
  - Ensure Long Term Ablation with no recanalization

- **Technique:**
  - Utilize Continuous Mode
  - Slow Pull Back
  - Energy Deposition of 2500 to 5500 J
Steam bubbles

Absorption of laser energy by hemoglobin & water results in the formation of steam bubbles.
Endovenous Laser: Long-Term results

<table>
<thead>
<tr>
<th>Follow-Up (Yrs)</th>
<th>Closed / No. Treated</th>
<th>Continued Occlusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 1 Year</td>
<td>218 / 231</td>
<td>94 %</td>
</tr>
<tr>
<td>1 – 2 Years</td>
<td>245 / 247</td>
<td>99 %</td>
</tr>
<tr>
<td>2 – 3 Years</td>
<td>151 / 151</td>
<td>100 %</td>
</tr>
<tr>
<td>&gt; 3 Years</td>
<td>72 / 72</td>
<td>100 %</td>
</tr>
</tbody>
</table>

- Followed 3 – 42 months (mean of 20 months)

Several single center reports with vein closure rates 93 - 99%

Robert J. Min, MD
Post Endothermal Ablation Care

- Compression Stockings for two weeks
  - 30-40 mmHg of Compression
- Follow-up Ultrasound in 6 weeks
- Follow-up Sclerotherapy for branch varicose veins at 6 week and 12 week follow-up
The End Result!
Conclusions

- Proper treatment plan and evaluation is critical
- Adequate tumescent anesthetic is key
- Attention to procedural details (avoid spasm) is important
- Both RF and Laser have excellent results and have supplanted stripping as the primary treatment of incompetent veins