Endovascular and Minimally Invasive Treatment of Varicose Veins

Michael Schmidling, MD
Common Myths Surrounding Venous Disease

Patients...

- "Something I will have to learn to live with..."
- "They are only of cosmetic concern..."
- "There is nothing I can do about them..."
- "I don’t want to undergo surgery..."
Common Myths Surrounding Venous Disease

- Physicians...
  - “I don’t treat them…”
  - “Just elevate your legs…”
  - “Don’t treat these veins...you will need them later for bypass grafting…”
Reality...
Significance

- Improved awareness in both the medical community and the lay population
- There is now a better understanding of the implications and impact of venous reflux disease
- Significant health impacts
- Patients seek out “minimally invasive” procedures and “non-surgical therapies”
Significance

Your patients will be asking you!
Spectrum of Disease

- Spider veins and telangiectasias

Small reddish and purple veins near the skin surface (treatment usually considered cosmetic and not reimbursed by insurance)
Spectrum of Disease

- Reticular veins

Blue or green deeper veins under the skin surface (treatment usually considered cosmetic and not reimbursed by insurance)
Spectrum of Disease

- Varicose veins

Large bulging veins that are easily palpable
(usually symptomatic and treatment most often covered by insurance)
Spectrum of Disease

- Venous ulcers

Breakdown of the skin related to Failure of the venous system and Venous insufficiency (usually symptomatic and treatment most often covered by insurance)
Prevalence

Etiology of Varicose Veins

- Heredity
  - No known specific genetic factors
  - Reflux at saphenofemoral junction is 2X as likely in those with a parent with the condition

- Occupational
  - Those with jobs requiring long periods of standing
Etiology of Varicose Veins

- **Sex and hormones**
  - During menstrual cycle veins become more distensible due to hormonal influence
  - Pregnancy

- **Age**
  - Elastic lamina degenerates and smooth muscle layer atrophies
Clinical Presentation

- Leg heaviness and aching
- Exercise intolerance
- “Restless” legs
- Night cramps
- Edema
- Paresthesias
- Pain or tenderness along the course of a vein
- Skin changes
  - Edema and hyperpigmentation
  - Stasis dermatitis
  - Ulceration
Clinical Presentation

- Symptoms generally are least in the morning and worsen throughout the day
- Exacerbated by long periods of standing
- Often history of self medication with OTC analgesics and support stockings
- Veins often worsen during pregnancy
- Progressive worsening
Clinical Presentation – Clinical CEAP Classification

- Class
  - 0 – no signs or symptoms
  - 1 – spider or reticular veins
  - 2 – varicose veins
  - 3 – edema
  - 4 – skin changes
  - 5 – healed ulcer
  - 6 – active ulcer
Normal Anatomy and Physiology

- Unlike upper extremity veins, the veins of the lower extremities are subjected to significant hydrostatic pressure.
- Normal valves help “segment” this column of blood to reduce the pressure felt by any segment of the vein.
- Venous system is a low pressure system.
Normal Anatomy and Physiology

- Deep and a superficial system separated by the deep muscular fascia
- Deep system is relatively high pressure due to the “calf pump” mechanism to facilitate venous return to the heart
- The superficial system is a lower pressure, capacitance system
Normal Anatomy and Physiology

- **Deep System**
  - CFV
  - Femoral vein
  - Popliteal vein
  - Calf veins – tibial and gastrocnemius

- **Superficial System**
  - GSV
  - LSV
  - Tributaries

- **Perforators**
Normal Anatomy and Physiology

Diagram of the leg showing:
- 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
Normal Anatomy and Physiology

- Giacomini Vein
- to deep system via perforator
- Popliteal Vein
- Short Saphenous Vein
Normal Anatomy and Physiology
Normal Anatomy and Physiology
Normal Anatomy and Physiology

- Calf Pump
  - Calf muscles contract and due to the tight, rigid muscular fascia results in elevated pressure to "pump" the blood against gravity and towards the heart
  - When the muscles relax, pressure decreases and allows flow from the superficial to deep system via perforators
  - Competent valves in the perforators and superficial system prevent exposure of the superficial system to the higher pressures of the deep system
Etiology of Venous Insufficiency

Normal Venous Function

Venous Insufficiency

Valve prevents backwards bloodflow

Faulty valve allows backwards bloodflow
Superficial Venous Insufficiency
Superficial Venous Insufficiency
Superficial Venous Insufficiency
Superficial Venous Insufficiency
Superficial Venous Insufficiency
Superficial Venous Insufficiency
Common Patterns of Reflux
Great Saphenous Vein Reflux

Treatment Goals

- Eliminate reflux
  - SFJ and SPJ
  - Perforator(s)
- Ablate incompetent venous segments
- Eliminate recirculation
- Clinical improvement
Surgical Ligation and Stripping

- Traditional therapy
- Possible complications of surgery
  - Paresthesia, infection, bleeding, scars
- Prolonged recovery period
- Increased costs of in-hospital procedure
- Greater risks and costs associated with general anesthesia
Endovascular Varicose Vein Rx

Therapy of varicose veins has been revolutionized by endovascular techniques such as endovenous laser therapy.
Endovascular Varicose Vein Rx

- Endovascular ablation of Greater Saphenous Vein using laser or radiofrequency energy transmitted through a catheter based system

- Ancillary procedures: sclerotherapy and ambulatory phlebectomy

- Results comparable to (and often better than) ligation and stripping with decreased morbidity and shorter post procedure recovery time
Endovascular Varicose Vein Rx

- Basic tenent: Underlying venous insufficiency and valvular incompetence must be treated first.
- "Ancillary" procedures such as phlebectomy and sclerotherapy are doomed to failure if there is persistent underlying reflux.
Endovascular Varicose Vein Rx

The search for less invasive techniques to treat varicose veins has led to the development of:

- Ultrasound Guided Sclerotherapy (liquid and foam)
- Endovenous Laser Treatment

Diomed 810 nm Diode Laser
Endovenous Laser Treatment

Materials and Methods

- Venous mapping with duplex-ultrasound
- 5 Fr introducer sheath placed into GSV
- 600 micron laser fiber (Diomed, Inc., Andover, MA) introduced into sheath
- Laser fiber positioned at SFJ using US and direct visualization of red aiming beam
- 0.2% lidocaine delivered perivenously under sonographic guidance (distal to proximal)
Endovenous Laser Treatment

Materials and Methods

- 810 nm wavelength laser energy provided by Diomed Laser (Diomed, Inc., Andover, MA)
- Laser energy delivered endovenously 10 mm below SFJ and along GSV
- Fiber withdrawn at rate of 1-3 mm per second
- 14 watts continuous mode
- Class I (20-30 mm Hg) stockings for 4 wks
Procedure
Procedure
Procedure
Procedure
Procedure
Procedure
Procedure
Procedure
The Procedure
The Procedure
Post-procedure
Post-procedure
Post-procedure
Post-procedure
Post-procedure
Post-procedure
Post-procedure
Post-procedure
Post-procedure

PERIPATELLAR VARICOSITIES
Post-procedure
Ancillary Procedures

- **Phlebectomy**
  - After surgical prep, skin is anesthetized with dilute lidocaine solution
  - Small “stab” incisions are made with 16g admixture needle
  - Varicosities are hooked with a phlebectomy hook
  - Hemostats used to pull and “tease” the vein out
  - Repeated over course of varicosity
Ancillary Procedures

Phlebectomy hooks
Procedure
Procedure
Procedure
Procedure
Procedure
Procedure
Procedure
Procedure
Ancillary Procedures

- **Sclerotherapy**
  - Injection of a sclerosant agent that chemically “burns” the endothelium of vein causing occlusion
  - Polidocanol, STS, hypertonic saline, etc.

- **Variations**
  - US guided
  - “foam”
Ancillary Procedures

- Sclerotherapy
Greater Saphenous Vein

Pre-Treatment  1 Wk Post-EVLT
Greater Saphenous Vein

Pre-Treatment 1 Wk Post-EVLT
Greater Saphenous Vein

Pre-Treatment

2 Wks Post-EVLT
Greater Saphenous Vein

Pre-Treatment

Post-Treatment
Greater Saphenous Vein

Pre-Treatment

Post-Treatment
Posterior Medial Tributary

Pre-Treatment 4 Wks Post-EVLT
Lesser Saphenous Vein

Pre-Treatment

Post-Treatment
Endovenous Laser Treatment

- Results: Cornell Vascular

- 701 limbs treated in 610 subjects
- 595 (85%) presented with aching pain
# Endovenous Laser Treatment

## Results: Cornell Vascular

<table>
<thead>
<tr>
<th>Gender</th>
<th>512 (84%) women</th>
<th>98 (16%) men</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>range: 22 - 76 yrs</td>
<td>mean: 43 yrs</td>
</tr>
<tr>
<td>Side</td>
<td>371 (53%) left</td>
<td>330 (47%) right</td>
</tr>
<tr>
<td>Diameter</td>
<td>range: 4.1 - 35 mm</td>
<td>mean: 10 mm</td>
</tr>
<tr>
<td>Length</td>
<td>range: 9 - 70 cm</td>
<td>mean: 38 cm</td>
</tr>
</tbody>
</table>
Endovenous Laser Treatment -

**Results**

<table>
<thead>
<tr>
<th>Follow-Up (Yrs)</th>
<th>Closed / No. Treated</th>
<th>Continued Occlusion</th>
</tr>
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<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)
Endovenous Laser Treatment -

Results

- 98% (686/701) closed at 3 - 42 months
- 223 limbs followed at least 2 years demonstrate continued occlusion

Endovenous Laser Treatment -

**Results**

- > 99% with resolution of symptoms
- > 99% would recommend EVLT
- Bruising & mild / moderate tenderness (resolving in < 2 wks)
- **NO** skin burns, DVTs, or paresthesias
Endovenous Laser Treatment -

Conclusions

- Successful ablation of > 97% of limbs treated with endovenous laser
- Continued closure of more than 220 vein segments followed for > 2 years
- Results comparable or superior to other options available for treatment of GSV reflux
- EVLT offers these benefits with lower rates of complication and avoidance of general anesthesia
The Vein Center at Atlantic Medical Imaging

Michael Schmidling, MD

Rajesh Patel, MD

- Board certified radiologist with fellowship training in Interventional Radiology
- Certificate of Added Qualification in Vascular and Interventional Radiology
- Co-Directors of Vein Center
The Vein Center at Atlantic Medical Imaging

- All patients are evaluated at our Vein Center in Galloway.
- Complete consultation including H&P and duplex US performed.
- Entire spectrum of venous disease from spider veins to venous ulceration is treated.
- All procedures and follow up appointments at the Vein Center in Galloway.
- Procedures are done as an outpatient with light oral sedation and local anesthetic.
- Minimal recovery time is needed.
Bottom line
Thanks

- Robert J. Min, M.D., Cornell Vascular-Weill Medical College of Cornell University