Varicose Vein Therapy: An Introduction to Surgical and Endovascular Treatment

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Lower Extremity Venous Anatomy
Deep, Superficial, Perforating, Reticular veins
Located in two separate compartments (deep and superficial)

Deep Venous System:
Common Femoral, Femoral, Popliteal, Tibial
Serves to transport blood to right heart
Surrounded by dense tissue
Drains superficial venous system via perforators
>90% venous blood leaves limb through deep veins

Superficial Venous System:
Lesser, Greater, Accessory Saphenous Veins, Vein of Giacomini
Reservoir for deep system
Regulates body temperature by dilating
Surrounded by fatty tissue
Can dilate to accommodate large blood volumes

Perforator Veins
Perforate muscular fascia to connect deep with superficial veins
Have 1 way valve to prevent reflux from deep veins
Protect superficial veins from high pressures generated during muscle contraction

Reticular Veins
Tributaries that connect branch veins to superficial, deep and perforators

Pathophysiology
Leaflets of valves no longer meet properly and leads to valvular incompetence (reflux)
Blood flows backward, veins enlarge, become tortuous and varicose
Most common in superficial leg veins, subject to high pressure when standing

Valvular Agenesis Dilated Vein Wall Damaged Valves
(Courtesy of Angiodynamics)
Prevalence

20% adults in United States
venous insufficiency

25% Women
72% Women over 60 years

15% Men
40% Men over 60 years

27 Million Symptomatic in
United States

1.2 Million Symptomatic
Seeking Treatment

Risk Factors

Aging
Pregnancy
Female Gender
Obesity
Prolonged Standing
Thrombophlebitis
Family History (congenitally defective valves)

Signs and Symptoms

Aching/Pain/Tightness/Heaviness/Cramps
Pruritis
Varicose Veins
Venous Ulcers
Edema
Venous eczema
Hyperpigmentation
Atrophic Blanche (white scar tissue)

Venous Insufficiency: Chronic and Progressive
United States Prevalence

Varicose Veins
20+ million
Swollen Leg
6 million
Skin Changes
1 million
Skin Ulcer
500,000

Differential Diagnosis

Osteoarthritis
Sciatica
Osteomyelitis
Tendonitis
Ligamentous Injuries
Arthritis
Peripheral Neuropathy
Arterial Insufficiency

Exclusion Criteria

Pre-existing peripheral arterial disease
Inability to ambulate
Coagulation disorder
DVT
Pregnancy
General poor health

Diagnostic Testing: Duplex Ultrasound

The Gold Standard

Rule out Deep Venous Thrombosis

Assess for reflux in Superficial and Perforator Veins

Map vein to be treated, branches, aneurysmal segments, tortuosity and plan procedure

Post procedure assessment (closed segment, DVT)

Pre-procedure Mapping

Evaluate standing (weight on opposite limb)

Leg externally rotated

Note depth of vein, diameters, anatomy, perforators, duplicate systems, branches, access site

Diagnostic Testing: Duplex Ultrasound

SFJ incompetence leads to GSV reflux (retrograde and/or bi-directional flow)

Normal valve closure time is <0.5 sec

Positive test if reversal of flow lasting >0.5 sec (after augmentation)

Elicit reflux with manual compression and release of calf veins, vein clusters or Valsalva

Diagnostic Testing: Duplex Ultrasound

7-10 MHz high frequency transducer

Color and Doppler velocity set for 5-10 cm/sec

Normal valve closure after augmentation

GSV at SFJ positive for reflux with Valsalva

Saphenofemoral Junction: Femoral, Epigastric, Greater Saphenous Veins

Mickey Mouse Ears

Venous Insufficiency Work Sheet
CEAP Classification of Venous Disease:
Clinical Severity, Etiology, Anatomy, Pathophysiology

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C 0</td>
<td>No evidence of venous disease.</td>
</tr>
<tr>
<td>C 1</td>
<td>Superficial spider veins (reticular veins) only</td>
</tr>
<tr>
<td>C 2</td>
<td>Simple varicose veins only</td>
</tr>
<tr>
<td>C 3</td>
<td>Ankle edema of venous origin (not foot edema)</td>
</tr>
<tr>
<td>C 4</td>
<td>Skin pigmentation in the gaiter area (lipodermatosclerosis)</td>
</tr>
<tr>
<td>C 5</td>
<td>A healed venous ulcer</td>
</tr>
<tr>
<td>C 6</td>
<td>An open venous ulcer</td>
</tr>
</tbody>
</table>

Treatment Options
Avoid standing
Raise legs when resting/sleeping
Compression Stockings
Surgery
Vein Ablation (Laser or Radiofrequency)
Phlebectomy
Sclerotherapy

Surgical Treatment
Saphenous Vein Stripping - remove all or part of saphenous vein, post-op incapacity, hematomas, paresthesias, DVT, wound complications including infection, 150,000/year in United States
Ligation
Phlebectomy
Cryosurgery - probe freezes vein, variant of stripping

Vein Ablation
Eliminate source of reflux:
Incompetent saphenofemoral junction and perforators
Ablate incompetent venous segments
Offer alternative to traditional treatment (ligation and stripping)
Avoid surgery at groin to preserve venous drainage from abdominal wall

Vein Ablation
Treatment < 1 hour and immediate relief
Immediate return to normal activity
Minor soreness or bruising treated with over-the-counter pain relievers
Lower treatment costs compared to surgery
Vein Ablation

- No scars or stitches
- Success rate 93-95%
- Faster Recovery
- Fewer Complications

Follow-up treatment to smaller branch veins needed after initial procedure

Radiofrequency Ablation

- Even and uniform heat to contract collagen in vein wall causing collapse and sealing.

ClosureFAST catheter ablates vein in 7cm segments with 20 second treatment cycles

Multicenter prospective study 93% occlusion at 3 years

Vein Access

- Reverse Trendelenberg
- Sonographic guided access to place 7 Fr 11cm sheath

Catheter Positioning

- Catheter tip 1-2cm distal to SFJ
- Visualize with ultrasound

Perivenous tumescent infiltration
- Trendelenburg position
- Good wall contact needed, apply external compression along length of heating element by compressing vein around catheter

Perivenous Tumescent Anesthesia

- Needle into saphenous canal
- Infuse 0.1% lidocaine with epinephrine solution (450 ml NS plus 50 ml 1% lidocaine plus 5 ml 8.4% sodium bicarb)
- Distribute sufficient volume around entire vein
- Heat sync protects surrounding tissue

Effective Analgesia
Radiofrequency Ablation
Compress vein
Press Start-vein heated to 120°C within 3-5 seconds
Collagen fibres 80°C
RF generator terminates energy delivery after 20 seconds
Pullback catheter using visual markers
Treat entire length of vein, double treat first segment
Record number of cycles and time

Post Procedure
Compression bandage for 2-3 days
Compression stockings for 2 weeks
Follow up U/S in 1 week, 1/3/6 months, then annually
Return to normal activities and ambulate frequently
Phlebectomy, sclerotherapy as needed

Laser Ablation
Laser energy heats blood causing coagulation to close off diseased vein
ELVeS P1 Laser System (Bioditec), VenaCure EVLT System (Angiodynamics), Medilas D FlexiPulse (Dornier)
Current most common wavelength 1470nm diode water based laser to deliver 30-50 joules/cm
Higher wavelength less joules/cm, less post op pain/bruising, so equivalent to RF treatment
Earlier lasers lower wavelengths, so more post op bruising (810nm, 940nm, 980nm)

Joules = Watts X Time
Pullback based on delivery of joules to vein
If 16 cm vein length (national average), 1 cm wide, 4 cm deep:
Operate on 6 watts
Want 50 joules/cm for big vein
Therefore 8.25 seconds/cm pullback
5 mm wide vein, 1 cm deep
Want 30 joules/cm
5 seconds/cm pullback

Laser Ablation
Standard pre-operative evaluation
Sterile prep and drape leg
Needle entry into GSV under U/S guidance
Advance wire through needle
Place introducer sheath
Position laser fiber 1-2 cm below SFJ

Laser Ablation
Administer Tumescent anesthesia
Laser switched to ready mode
Re-confirm tip position
Eye protection for staff and patient
Activate laser and pullback fiber
Standard post-operative care
**Laser Ablation**

Larger diameter veins  
Tortuous Veins  
Perforators

Varicose veins treated with EVLT and 2 week follow up

3 year old ulcer treated with EVLT and 3 week follow up

Courtesy of Angiodynamics

**Laser vs. RF**

Physician preference

More operator control if pullback with laser  
4-5 Fr. Laser smaller and more flexible for tributaries

RF catheter and sheath 7 Fr.  
RF stiff 7 cm probe

No laser protection needed if RF  
RF segmental ablation simple  
RF controlled heat delivery  
Laser disposables less costly

**Phlebectomy**

First treat reflux  
Visual and palpable abnormal vein removed through small incision  
Local anesthesia  
Rapid recovery with fast return to normal activity

**Sclerotherapy**

Sclerosants include polidocanol (POL), sodium tetradecyl sulphate (STS), Hypertonic Saline, Glycerin and Chromated Glycerin

Mix using Tessari method at varying concentrations sclerosant/gas proportions, with air or CO₂ or O₂ to create foams  
(1ml sclerosant/3ml air)

Injection with fine needle into spider veins (telangiectasias), always recur

Ultrasound Guided – catheter into vein followed by injection

**American College of Phlebology**

Mission: To advance vein care

www.phlebology.org

**American Venous Forum**

Dedicated to improving the care of patients with venous and lymphatic disease

www.veinforum.org
Summary

Educate and credential yourself

Courses

Company Support

New Service Line