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 Ulcers

Varicose Veins

Swollen Leg

Skin Changes

Skin Ulcer

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

Differential Diagnosis

Osteoarthritis
Sciatica
Osteomyelitis
Tendonitis
Ligamentous Injuries
Arthritis
Peripheral Neuropathy
Arterial Insufficiency

Exclusion Criteria

Prolonged Standing
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 5-10cm/sec

Normal valve closure after augmentation
GSV at SFJ positive for reflux with Valsalva

Venous Insufficiency Work Sheet

Saphenofemoral Junction: Femoral, Epigastric, Greater Saphenous Veins

Mickey Mouse Ears
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

Surgical Treatment

- Recurrence Rates 5-60% over 10 years
- Complications 21%
- Replaced by venous ablation

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.

Radiofrequency Ablation
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 Anesthesia
Needle into saphenous canal
Infuse 0.1% lidocaine with epinephrine solution (450 ml NS plus 50 ml 1% lido with epi plus 5 ml K4% sodium bicarb)
Distribute sufficient volume around entire vein
Heat sync protects surrounding tissue
Effective Analgesia
**Radiofrequency Ablation**

Compress vein
- Press Start-vein heated to 120C within 3-5 seconds
- Collagen fibroses 80C
- 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 PL Laser System (Biolitic), 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)

**Laser Ablation**

- 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

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 (telangectasias), 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