**Varicose Veins**

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**Chronic Venous Disease**

Definition: A spectrum of signs and symptoms that ranges from spider and varicose veins to chronic venous insufficiency.

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**Definition**

**Spider Veins or Telangiectasias**

- Non raised dilated intradermal veins/venules  
- Typically ≤1 mm in diameter  
- Appear earlier than varicose veins  
- Blue or Red

Photos courtesy of Dr. Eric Mowatt-Larssen
Reticular Veins

- Dilated, non-palpable subcutaneous veins
- Blue-green
- 1-3 mm
- Sometimes coexist with and “feed” telangiectasias

Photo courtesy of the American College of Phlebology/American Venous Forum (ACP/AVF)

Varicose Veins

- Dilated, tortuous, palpable subcutaneous veins ≥ 3 mm (upright)
- Synonyms: varix, varices, varicosities
- Involve great and/or small saphenous veins (GSV/SSV) or any superficial vein tributaries

Photo courtesy of Dr. Mowatt-Larssen

Prevalence

Varicose Veins may be found in the teen years

<table>
<thead>
<tr>
<th></th>
<th>10-12 y/o</th>
<th>14-16 y/o</th>
<th>18-20 y/o</th>
</tr>
</thead>
<tbody>
<tr>
<td>Varicose Veins</td>
<td>0</td>
<td>1.7%</td>
<td>3.3%</td>
</tr>
</tbody>
</table>

Prevalence of Spider & Varicose Veins

<table>
<thead>
<tr>
<th>Reference, year</th>
<th>Country</th>
<th>C1 All (%)</th>
<th>C1 M (%)</th>
<th>C1 F (%)</th>
<th>C2 All (%)</th>
<th>C2 M (%)</th>
<th>C2 F (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Critchlow, 2003b</td>
<td>USA</td>
<td>51.6</td>
<td>43.6</td>
<td>59.9</td>
<td>23.3</td>
<td>15.0</td>
<td>27.7</td>
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<tr>
<td>Jawor, 2001b</td>
<td>Poland</td>
<td>16.5</td>
<td>21.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rabe, 2001a</td>
<td>Germany</td>
<td>59.2</td>
<td>56.4</td>
<td>59.5</td>
<td>14.3</td>
<td>12.4</td>
<td>15.8</td>
</tr>
<tr>
<td>Carpentieri, 2004a</td>
<td>France</td>
<td>64.8</td>
<td>33.1</td>
<td>40.4</td>
<td>23.7</td>
<td>46.2</td>
<td></td>
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<tr>
<td>Chiou, 2004a</td>
<td>Italy</td>
<td>64.8</td>
<td>33.1</td>
<td>40.4</td>
<td>23.7</td>
<td>46.2</td>
<td></td>
</tr>
</tbody>
</table>

Epidemiology

Varicose & Spider Veins

- Varicose veins occur in 2-3% of teens
- Varicose veins occur in ~25% of adults
- Spider veins occur in ~60% of adults
- Spider and varicose veins are 2-3 times more likely to affect females

Varicose Vein Risk Factors

- Family history
- Age
- Pregnancy
- Female
- Occupation requiring prolonged standing and/or straining
- Sedentary occupation and/or lifestyle
- Obesity
- Height
- Neuromuscular disorder
Varicose Veins are a Hereditary Disorder

134 families examined
The risk of developing varicose veins:
• 89% if both parents had varicose veins
• 47% if one parent had varicose veins
• 20% of neither parent had varicose veins

Autosomal dominant with incomplete penetrance


Varicose Veins increase with Age

<table>
<thead>
<tr>
<th>Age</th>
<th>% of Men with Varicose Veins</th>
<th>% of Women with Varicose Veins</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>45</td>
<td>11</td>
<td>18</td>
</tr>
<tr>
<td>65</td>
<td>38</td>
<td>31</td>
</tr>
</tbody>
</table>

Widmer, et al Peripheral Venous Disorders, 1978

Multiparity: A Risk Factor for Varicose Veins

405 women with varicose veins
• 13% had one pregnancy
• 30% had two pregnancies
• 57% had three pregnancies

Mullane DJ Am J OB Gyn 1952; 63:620

Classification of Varicose Veins

3 potential mechanisms

1. Primary- intrinsic morphological and/or biochemical vein wall abnormality which leads to loss of elasticity; local or multifocal; most common
2. Secondary- prior DVT (PTS), deep venous obstruction, AVF, prior STP
3. Congenital- associated with vascular malformations
"We recommend that primary venous disorders, including *simple varicose veins*, be *differentiated* from secondary venous insufficiency and from congenital venous disorders because the three conditions differ in pathophysiology and management."

3 types of lower extremity VEINS

Physiologic Blood Flow:

Superficial to Deep Veins

“Up & In”

Perforating Vein


Superficial venous system

Small saphenous vein
- runs from lateral foot up posterior calf
- variations in termination

Illustration by Linda S. Nye

Superficial venous system

Great saphenous vein
- runs from dorsum of foot medially up leg
- ALTV, PMTV common tributaries

Illustration by Linda S. Nye

Perforating or “communicating” veins

- Hunterian
- Dodd
- Boyd
- Cockett
- Gastrocnemius
- Lateral thigh (lateral subdermic plexus)

Illustration by Linda S. Nye
**Macrovascular Pathophysiology**

**Pathological Venous Blood Flow**

*Deep to Superficial Veins*

*“Down & Out”*

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**Venous Valvular Dysfunction**

- Dilation of vein wall prevents opposition of valve leaflets, resulting in *reflux*
- Valvular fibrosis, destruction, or agenesis results in *reflux*


Hamden. JAMA 2012. 308(24): 2612-21
**History**

- History of problem: onset, pregnancies, prior DVT, immobilization
- Associated symptoms and relationship to heat, menses, exercise and compression
- Current medications
- Family history
- Previous treatment and result

**Manifestations of chronic venous disease [Varicose veins and CVI]**

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>Manifestations</th>
</tr>
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<tbody>
<tr>
<td>Pain</td>
<td>- Swelling</td>
</tr>
<tr>
<td>Stinging</td>
<td>- Pruritus</td>
</tr>
<tr>
<td>Burning</td>
<td>- Ulcers</td>
</tr>
<tr>
<td>Aching</td>
<td>- Nocturnal leg cramps</td>
</tr>
<tr>
<td>Fatigue</td>
<td>- Restless legs syndrome</td>
</tr>
<tr>
<td>Heaviness</td>
<td>- Peripheral neuropathy</td>
</tr>
<tr>
<td>Throbbing</td>
<td>- Venous claudication</td>
</tr>
</tbody>
</table>

**History: Important!**

- Varicose Veins typically cause *focal* pain and other varicose related symptoms.
- Pain and other manifestations *away* from varicose veins (especially when *diffuse*) is suggestive of reflux within the major axial superficial and/or deep veins!
- Isolated varicose and spider veins do not cause significant swelling!
Physical Examination

The care of patients with varicose veins and associated chronic venous diseases: Clinical practice guidelines of the Society for Vascular Surgery and the American Venous Forum

1. Clinical examination
   For clinical examination of the lower limbs for chronic venous disease, we recommend inspection (telangiectasia, varicosity, edema, skin discoloration, corona phlebectatica, lipodermatosclerosis, ulcer), palpation (cord, varicosity, tenderness, induration, reflux, pulses, thrill, groin or abdominal masses), auscultation (bruit), and examination of ankle mobility.

   *Examine patient in the standing position!*


CEAP: Clinical Classification of Chronic Venous Disease

<table>
<thead>
<tr>
<th>CEAP</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C₀</td>
<td>No visible or palpable signs of venous disease</td>
</tr>
<tr>
<td>C₁</td>
<td>Telangiectases or reticular veins</td>
</tr>
<tr>
<td>C₂</td>
<td>Varicose veins</td>
</tr>
<tr>
<td>C₃</td>
<td>Edema</td>
</tr>
<tr>
<td>C₄a</td>
<td>Pigmentation and/or eczema</td>
</tr>
<tr>
<td>C₄b</td>
<td>Lipodermatosclerosis and/or atrophic blanche</td>
</tr>
<tr>
<td>C₅</td>
<td>Healed venous ulcer</td>
</tr>
<tr>
<td>C₆</td>
<td>Active venous ulcer</td>
</tr>
</tbody>
</table>


> C₃ = CVI

Varicose Veins [C2] – Great Saphenous Vein Distribution

- Most common finding in patients with varicose veins
- Varicosities along the medial thigh and calf

Photo courtesy of the American College of Phlebology/American Venous Forum (ACP/AVF)
Varicose Veins [C2] – Small Saphenous Distribution

- Less frequent than Great Saphenous involvement
- Varicosities may be seen on the posterior calf and lateral ankle
- Skin changes are seen along the lateral ankle

Acute Lipodermatosclerosis: [C4b]

- Acute inflammation within the distal medial calf
- DDX: cellulitis, superficial thrombophlebitis

Swelling [C3]

Chronic eczematous stasis dermatitis [C4b]

Inverted “Champagne Bottle” or “Bowling Pin” Legs

Chronic Lipodermatosclerosis [C4b]
Atrophie Blanche [C4b]

Hyperpigmentation [C4a]

"Ankle Flair" Sign /
Corona Phlebectatica [C1]

Healed ulceration [C5]

Stasis Ulcerations [C6]
Unusual presentations

Varicose Veins of Pelvic Origin
- Begin during pregnancy
- Increased symptoms during pre-menstrual period
- May be associated with pelvic congestion syndrome (internal iliac and/or gonadal vein reflux)- dysuria; dyspareunia; pelvic heaviness

Muscle fascia herniation
- Frequently confused with varicose veins
- Usually found on the lateral calf
- Bulge disappears with dorsiflexion of the foot
- No flow is audible with continuous-wave Doppler examination

Duplex ultrasonography

Photo courtesy of the American College of Phlebology/American Venous Forum (ACP/AVF)

Photo courtesy of Dr. Marcus Stanbro
Therapy with Dr. Vermilion

Varicose Veins: Treatment

Blair Vermilion, MD
Associate Professor of Clinical Surgery
Division of Vascular Diseases and Surgery
The Ohio State University Wexner Medical Center

Venous Disease: Treatment Guidelines

- Make the correct diagnosis
  - History and Physical
  - Appropriate testing
    - Document any arterial disease
    - Document level and degree of reflux
- Try conservative methods first
- Educate the Patient regarding realistic outcomes and potential complications
- Compliance, Compliance, Compliance
Venous Disease: Treatment Options

- Compression Therapy
- Sclerotherapy
- Surgery
  - Thermal ablation (Laser or Radio Frequency)
  - Phlebectomy
  - “Stripping”
  - SFJ Ligation
- Combination of any and all of the above

Venous Disease: Compression Therapy

- Indications for Compression Therapy
  - Chronic Venous Insufficiency
  - Venous Ulcers, Dermatitis
  - Post Sclerotherapy or Surgery
  - Superficial Phlebitis
  - DVT (with anticoagulation)
  - Post Phlebitic Syndrome

- Contraindications for Compression Therapy
  - Diminished Arterial Flow (<70 mm Hg)
  - Acute DVT without sufficient collaterals
  - Severe CHF
  - Undefined, non-venous Ulcers

Venous Disease: Compression Therapy

- Unna’s Boot
  - Calamine lotion and zinc oxide
  - High working pressure
  - Low resting pressure
  - Can be worn at night
  - Use for Dermatitis, Ulcers
  - Can be changed once/week
Venous Disease: Compression Therapy

**Ace Wrap: Bandaging Principles**
- Start at the base of the toes
- Apply no more than 50% stretch
- Overlap ~50% to avoid skin pinching
- Oblique turns (not circular) to minimize constriction
- Dorsiflex ankle joint when applying bandage
- Foam padding to protect malleolar or thin-skinned area
- Graduated pressure is achieved by applying even pressure. Smaller diameter areas have increased pressure with equal tension
- Increase pressure by applying multiple layers

**Gradient support stockings**
- Low working pressure—minimal effect on deep venous return
- High resting pressure—excellent reflux prevention
- Uniform application with right size
- Can be hard to get on
- Uncomfortable at night due to high resting pressure
- Great for maintenance and long term treatment
- Reduces further dilatation of Varicose Veins
- Examples Sigvaris, Jobst, Medi

**15 to 20 mm Hg**
- Leg fatigue, mild varicities

**20 to 30 mm Hg**
- Aching, heaviness, mild edema, moderate varicities, post sclerotherapy

**30 to 40 mm Hg**
- Post phlebitic syndrome, severe edema, lipodermatosclerosis, ulcerations, failure of lower compressions

**40 to 50 mm Hg**
- Lymphedema, failure of lower compressions

**Guidelines**
- Works best if no reflux from truncal veins
- Treat larger veins first
- Treat proximal to distal
- Treat entire vessel
- Maintain post injection compression
- Ambulate patient
- Re-evaluate @ 7 to 10 days
- Select solution and concentration based on vein size

Sclerotherapy
### Venous Disease: Sclerotherapy

- **Complications of Sclerotherapy**
  - Vasovagal Attack
  - Allergic reaction
  - Skin necrosis
  - Venous thrombosis
  - Arterial Injection/injury
  - Nerve Injection/injury
  - Skin Discoloration (Hyperpigmentation)
  - Telangiectatic matting

### Sclerotherapy

- **Mechanism:**
  - Solution causes irreversible chemical damage to the endothelial cell layer
  - Size of vein and flow in vein are variable therefore results are variable
  - Results in “zones” of injury

### Contraindications to Sclerotherapy of Varicose Veins

- Bedridden Patient
- Severe Arterial Disease
- Hypercoagulable state
- Pregnancy
- Morbid Obesity
- Poor tolerance of compression hose
- Allergies to the agents used

### Types of Sclerosants

- **Detergents:**
  1. Sodium Morrhuate: Fatty acid extract from Cod liver oil. Can cause extensive necrosis and possible anaphylaxis
  2. Ethanolamine Oleate: synthetic and has high viscosity
  3. Sotradecol: synthetic FFA, reliable and safe; tends to cause hyperpigmentation in higher concentrations
  4. Polidocanol: synthetic FFA; not FDA approved; very safe; rare anaphylaxis and minimal hyperpigmentation
  5. Glycerin: very weak and very viscous; rarely causes hyperpigmentation, necrosis or matting
Types of Sclerosants

- Hypertonic and Ionic Solutions:
  1. Hypertonic Saline: not effective in larger veins due to dilution; high incidence of staining and necrosis; painful
  2. Sclerodex: 25% Dextrose + 10%NaCl + phenethyl alcohol; painful and can cause necrosis
  3. Polyiodinated Iodine: Not FDA approved but used some in Europe

EndoVenous Laser Treatment

- Ambulatory procedure
- Can be done in most cases under local, tumescent anesthesia with sedation
- Patients typically resume activity immediately and see results quickly, with minimal chance of scarring, sutures, long hospital stay, lengthy recovery, or surgical complications

EndoVenous Laser Treatment

- Results in ablation of treated vein
- The laser introduces thermal energy to the venous tissues, causing irreversible localized venous tissue damage
- Laser energy (most commonly from an 810-nm diode laser) is delivered inside the vein through a bare laser fiber that has been passed through a sheath to the desired location
- The laser is continuously fired (or in pulses) as the laser fiber is gradually withdrawn along the course of the vein until the entire vessel is treated

EndoVenous Laser Treatment

- Disadvantages:
  - 3% failure rate
  - Ecchymosis
  - Paresthesias
  - DVT (1%)
  - Not as effective on larger (>1.5cm.) veins
EndoVenous Laser Treatment

- Safety Issues
- Lasers emit beams of non-ionizing optical radiation
  - Eye Hazards: retina/corneal
  - Skin Hazards
  - Fire Hazards
Insert Laser Sheath Over Wire

Document Catheter Placement

Inject Tumescence along course of Catheter Using Ultrasound
**EVLT: Tumescent**

- Provides Anesthesia
- Dissipates heat

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**EVLT: Post Procedure Ultrasound**

Document GSV Ablation

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**EndoVenous Laser Treatment**

- **Case Presentation:**
  - 45 y.o. female, Varicosities
  - Sx: Aching, heaviness
  - P.E. Visible varicosities
  - Conservative Rx failed
  - U/S: Reflux GSV to below knee

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**EVLT**

Withdraw Laser ~40-50 Joules per cm.
EndoVenous Laser Treatment

Next Day

Saphenous Vein Stripping

• “GOLD STANDARD”
• STEPS:
  – Incisions at groin and ankle or lower leg
  – Ligate and divide S-F junction
  – Pass stripper from Lower leg to groin inside vein
  – Tie vein to stripper and pull stripper out, avulsing the vein
• COMPLICATIONS:
  – Hematoma, Wound infection, parasthesia of the saphenous nerve
• OTHER DISADVANTAGES
  – Pain, bruising, time off work, anesthesia, groin incision

EndoVenous Laser Treatment

• Results of Treatment:
  – 90% - 98% Resolution of reflux
  – 85% resolution of Visible Veins
  – 96% improvement of pre-op symptoms
• Compared to Vein Stripping
  • Less costly in ambulatory setting
  • Quicker recovery
  • Less post-op pain

Stripping: Varicosity Recurrence

<table>
<thead>
<tr>
<th></th>
<th>Blomgren</th>
<th>57%</th>
<th>6-10 years</th>
</tr>
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<tbody>
<tr>
<td>Sarin</td>
<td>35%</td>
<td>21 months</td>
<td></td>
</tr>
<tr>
<td>Jones</td>
<td>25%</td>
<td>2 years</td>
<td></td>
</tr>
<tr>
<td>Dwerryhouse</td>
<td>23%</td>
<td>5 years</td>
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</tr>
</tbody>
</table>

# Stab Phlebectomy

- Office procedure with sedation and/or in conjunction with surgery
- Eliminate truncal reflux first