Definition

Prevalence

Overview of Chronic Venous Insufficiency

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The Ohio State University

Chronic Venous Insufficiency

“an abnormally functioning venous system caused by venous valvular reflux with or without associated venous outflow obstruction which may affect the superficial, deep, and/or the perforating venous system(s). The venous dysfunction may result from congenital or acquired processes”

SVS/ISCVS. J Vasc Surg 1988

Definition

Prevalence
Chronic Venous Insufficiency/Varicose Veins: Prevalence

- The prevalence of varicose veins in Western countries classically ranges between 25 to 30% in females and 10 to 20% in males.
- Duesseldorf/Essen civil servant study of 9261 employees, 27% of subjects were identified with small cutaneous and/or reticular veins whereas only 9% had typical varicose veins.
- Edinburgh Vein Study - over 80% of the studied population manifested telangiectatic and reticular veins.

Chronic Venous Insufficiency/Varicose Veins: Epidemiology

Clinical manifestations of CVI such as dermal hyperpigmentation, eczema, and edema vary from <1% to 17% in males and <1% to 20% in females.

The prevalence of active or healed venous stasis ulcerations is lower, occurring in ~1% of the population.

Collectively, CVI and varicose veins comprise the most common vascular condition.

Established and potential risk factors for varicose veins (VV) and chronic venous insufficiency (CVI):

<table>
<thead>
<tr>
<th></th>
<th>VV</th>
<th>CVI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Older age</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Family history</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Female gender</td>
<td>+</td>
<td>-/+0</td>
</tr>
<tr>
<td>Standing occupation</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Constipation, low fiber intake</td>
<td>+/0</td>
<td>0</td>
</tr>
<tr>
<td>Obesity</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Smoking</td>
<td>+/0</td>
<td>+/0</td>
</tr>
<tr>
<td>Oral contraceptives/HRT</td>
<td>-/0</td>
<td>-/0</td>
</tr>
<tr>
<td>Hypertension</td>
<td>+/-</td>
<td>+/-</td>
</tr>
<tr>
<td>Physical activity</td>
<td>-/0</td>
<td>-</td>
</tr>
<tr>
<td>Injury</td>
<td>+/-</td>
<td>+</td>
</tr>
<tr>
<td>History of phlebitis</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

- Negative association
- Weak association
0: No association

Socioeconomic Impact

- Stasis ulcerations are responsible for the loss of ~ 2 million working days and $ 3 billion/year in the US\(^1\)
- Chronic venous insufficiency responsible for 1 to 3% of the total health care budget in developed countries\(^2,3\)
- CVI is associated with a reduced QOL which is proportional to the severity of venous HTN\(^4\)


Anatomy

3 Types of Lower Extremity Veins

Nomenclature of the veins of the lower limbs: An international interdisciplinary consensus statement

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>Greater or long saphenous vein</td>
<td>Great saphenous vein</td>
</tr>
<tr>
<td>Lesser or short saphenous vein</td>
<td>Small saphenous vein</td>
</tr>
<tr>
<td>Superficial femoral vein</td>
<td>Femoral vein</td>
</tr>
</tbody>
</table>

Physiology

<table>
<thead>
<tr>
<th>Competent Venous Valve</th>
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<tbody>
<tr>
<td><img src="image" alt="Diagram of Competent Venous Valve" /></td>
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<table>
<thead>
<tr>
<th>Macrovascular Pathophysiology</th>
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<tbody>
<tr>
<td><img src="image" alt="Macrovascular Pathophysiology Diagram" /></td>
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</table>
Venous Valvular Dysfunction

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

Doppler Exam: Reflux

Microvascular Pathophysiology

Illustration by Linda S. Nye
Microvascular pathophysiology in CVI that ultimately provokes skin changes

History

- Pain
- Stinging
- Burning
- Aching
- Fatigue
- Heaviness
- Throbbing

Physical

- Swelling
- Pruritus
- Ulcers
- Nocturnal leg cramps
- Restless legs syndrome
- Peripheral neuropathy
- Venous claudication

Signs & symptoms of chronic venous disease [Varicose veins and CVI]
## CEAP: Clinical Classification of Chronic Venous Insufficiency

<table>
<thead>
<tr>
<th>CLASS</th>
<th>CLINICAL SIGNS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No visible or palpable signs of venous disease</td>
</tr>
<tr>
<td>1</td>
<td>Telangiectasia or reticular veins</td>
</tr>
<tr>
<td>2</td>
<td>Varicose veins</td>
</tr>
<tr>
<td>3</td>
<td>Edema</td>
</tr>
<tr>
<td>4</td>
<td>Skin changes ascribed to venous disease (e.g., pigmentation, venous eczema, lipodermatosclerosis)</td>
</tr>
<tr>
<td>5</td>
<td>Skin changes as defined above with healed ulceration</td>
</tr>
<tr>
<td>6</td>
<td>Skin changes as defined above with active ulceration</td>
</tr>
</tbody>
</table>

1994 Executive Committee of the American Venous Forum

**Atrophie Blanche [C₅]**

**Hyperpigmentation [C₄]**

**“Ankle Flair” Sign/Corona Phlebectatica [C₁]**

**Swelling [C₃]**

**Chronic eczematous stasis dermatitis [C₄]**

**Chronic Eczematous Stasis Dermatitis/ Hyperpigmentation [C₄]**

**2° Lymphedema [C₃]**
Acute Lipodermatosclerosis: \([C_4]\)
Stasis associated sclerosing panniculitis[SASP]

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

Stasis Ulcerations \([C_6]\)

Chronic Lipodermatosclerosis \([C_4]\)
Stasis Associated Sclerosing Panniculitis

Inverted
“Champagne Bottle”
or “Bowling Pin” Legs
CVI does not cause marked pitting edema!

Varicose Veins: Treatment

Blair Vermilion, M.D.
Associate Professor of Clinical Surgery
Ohio State University

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
  - “Stripping”
  - SFJ Ligation
  - Phlebectomy
  - Ablation (Laser or Radio Frequency)
- 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)

#### Contraindications for Compression Therapy
- Diminished Arterial Flow (<70 mm Hg)
- Acute DVT without sufficient collaterals
- Severe CHF
- Undefined, non-venous Ulcers
<table>
<thead>
<tr>
<th>Venous Disease: Compression Therapy</th>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>Bandages</strong></td>
<td><strong>Dorsiflex ankle joint when applying bandage</strong></td>
</tr>
<tr>
<td>✓ Unna’s Boot</td>
<td>✓ Foam padding to protect malleolar or thin-skinned area</td>
</tr>
<tr>
<td>✓ High working pressure</td>
<td>✓ Graduated pressure is achieved by applying even pressure. Smaller diameter areas have increased pressure with equal tension</td>
</tr>
<tr>
<td>✓ Low resting pressure</td>
<td>✓ Increase pressure by applying multiple layers</td>
</tr>
<tr>
<td>✓ Can be worn at night</td>
<td>✓ Increase pressure by applying multiple layers</td>
</tr>
<tr>
<td>✓ Use for Dermatitis, Ulcers</td>
<td>✓ Can be changed once/week</td>
</tr>
</tbody>
</table>

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<tr>
<th>Venous Disease: Compression Therapy</th>
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<tr>
<td><strong>Bandaging Principles</strong></td>
<td><strong>Gradient support stockings</strong></td>
</tr>
<tr>
<td>✓ Start at the base of the toes</td>
<td>✓ Low working pressure—minimal effect on deep venous return</td>
</tr>
<tr>
<td>✓ Apply no more than 50% stretch</td>
<td>✓ High resting pressure—excellent reflux prevention</td>
</tr>
<tr>
<td>✓ Overlap ~50% to avoid skin pinching</td>
<td>✓ Uniform application with right size</td>
</tr>
<tr>
<td>✓ Oblique turns (not circular) to minimize constriction</td>
<td>✓ Can be hard to get on</td>
</tr>
</tbody>
</table>
### Venous Disease: Compression Therapy

<table>
<thead>
<tr>
<th>Pressure Range</th>
<th>Applications</th>
</tr>
</thead>
</table>
| 15 to 20 mm Hg | - Leg fatigue, mild varicities  
- Aching, heaviness, mild edema, moderate varicities, post sclerotherapy |
| 20 to 30 mm Hg |  |
| 30 to 40 mm Hg | - Post phlebitic syndrome, severe edema, lipodermatosclerosis, ulcerations |
| 40 to 50 mm Hg | - Lymphedema, failure of lower compressions |

### Sclerotherapy

<table>
<thead>
<tr>
<th>Guidelines</th>
</tr>
</thead>
</table>
| - Works best if no reflux from truncal veins  
- Treat larger veins first  
- Treat proximal to distal  
- Treat entire vessel |
**Sclerotherapy**

- Maintain post injection compression
- Ambulate patient
- Re-evaluate @ 7 to 10 days
- Select solution and concentration based on vein size

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**Venous Disease: Sclerotherapy**

- Venous thrombosis
- Arterial Injection/injury
- Nerve Injection/injury
- Skin Discoloration
- Telangiectatic matting

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**Venous Disease: Sclerotherapy**

- **Complications of Sclerotherapy**
  - Vasovagal Attack
  - Allergic reaction
  - Skin necrosis

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**Venous Disease: Sclerotherapy**

- **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
**EndoVenous Laser Treatment**

- Results in ablation of treated vein
- The laser introduces thermal energy to the venous tissues, causing irreversible localized venous tissue damage

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**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

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**EndoVenous Laser Treatment**

- 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

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**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

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**Gain access via ultrasound guidance**

**Pass .035 J-wire to S.F Junction**
EVLT

Insert Laser Sheath Over Wire

Document Catheter Placement

Deep Vein
Saphenous Vein
Catheter

Inject Tumescence along course of Catheter Using Ultrasound

Document Laser tip location
**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
### Endo Venous Laser Treatment

- **Next Day**

<table>
<thead>
<tr>
<th>Endo Venous Laser Treatment</th>
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<tbody>
<tr>
<td><strong>Results of Treatment:</strong></td>
</tr>
<tr>
<td>✓ 90% - 98% Resolution of reflux</td>
</tr>
<tr>
<td>✓ 85% resolution of Visible Veins</td>
</tr>
<tr>
<td>✓ 96% improvement of pre-op symptoms</td>
</tr>
<tr>
<td>✓ Compared to Vein Stripping</td>
</tr>
<tr>
<td>• Less costly in ambulatory setting</td>
</tr>
<tr>
<td>• Quicker recovery</td>
</tr>
<tr>
<td>• Less post-op pain</td>
</tr>
</tbody>
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### Saphenous Vein Stripping

- **“GOLD STANDARD”**
- **COMPLICATIONS: UNCOMMON**
  - Hematoma, Wound infection, paresthesia of the saphenous nerve, recurrence rate.
- **OTHER DISADVANTAGES**
  - Pain, bruising, time off work, anesthesia, groin incision
<table>
<thead>
<tr>
<th>Name</th>
<th>Recurrence Rate</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blomgren</td>
<td>57%</td>
<td>6-10 years</td>
</tr>
<tr>
<td>Sarin</td>
<td>35%</td>
<td>21 months</td>
</tr>
<tr>
<td>Jones</td>
<td>25%</td>
<td>2 years</td>
</tr>
<tr>
<td>Dwerryhouse</td>
<td>23%</td>
<td>5 years</td>
</tr>
</tbody>
</table>


**Stripping: Varicosity Recurrence**

**Stab Phlebectomy**

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