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I do not have relevant financial relationships with any commercial interests.

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“It is ironic that medical education does not cover three of the most common medical problems: back pain, hemorrhoids, and varicose veins.”

P. Fujimura, MD
Surgical Intern
University of California School of Medicine

PHLEBOLOGY

The medical specialty devoted to the diagnosis and treatment of patients with venous disorders

Prevalence of Chronic Venous Disease

- 1 in 22 or 4.5% or 12.2 million people in the USA are affected by varicose veins
- Incidence increases with age and is more common in women with over 40% of women in their 50’s suffering from some sort of venous disorder
- Across all ages and gender, 60% of Americans suffer from venous disease and its sequelae

National Heart Lung and Blood Institute (NHLBI) http://www.nhlbi.nih.gov/
The Spectrum of Chronic Venous Disease

- Telangiectasias
- Varicose veins
- Superficial phlebitis
- Venous ulceration

Presenting Symptoms of Chronic Venous Disease

- Aching
- Fatigue, heaviness in legs
- Pain: throbbing, burning, stabbing
- Cramping
- Swelling (peripheral edema)
- Itching
- Restless legs
- Numbness

Epidemiology

Who Develops Venous Disease?
Venous Disease is a Hereditary Disorder

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


Heredity in Chronic Venous Insufficiency

Risk Factors for chronic venous disease:

The San Diego population study

Although some risk factors for venous disease such as age, family history of venous disease are immutable others can be modified, such as weight, physical activity, and cigarette smoking.

J Vasc Surg. 2007 August; 46(2): 331–337

The beginnings of venous disease may be found as early as childhood

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Diagnosable Vein Disease</th>
<th>Actual Varicose Veins</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-12 y/o</td>
<td>2.5%</td>
<td>0</td>
</tr>
<tr>
<td>14-16 y/o</td>
<td>12.3%</td>
<td>1.7%</td>
</tr>
<tr>
<td>18-20 y/o</td>
<td>19.8%</td>
<td>3.3%</td>
</tr>
</tbody>
</table>

Inactivity aggravates venous disease

- 2,854 patients with varicose veins, working in a factory
- 64.5% had jobs standing in one place
- 29.2% had jobs requiring prolonged periods of sitting
- 6.3% had jobs allowing frequent walking during their shift

Santier, R. Hautarzt 1956; 10:460

Varicose Veins are 3 times more common in women than men


Each pregnancy worsens the condition

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

Brand FN, et al The epidemiology of varicose veins: the Framingham Study

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Anatomy and physiology of the venous system in the lower extremity

- **Deep venous system:** the channel through which 90% of venous blood is pumped out of the legs
- **Superficial venous system:** the collecting system of veins
  - **Perforating veins:** the conduits for blood to travel from the superficial to the deep veins
- **Musculovenous pump:** Contraction of foot and leg muscles pumps the blood through one-way valves up and out of the legs
Deep system handles up to 90% of the venous blood volume.

Superficial venous system

- Great saphenous vein
  - runs from dorsum of foot medially up leg
  - site of highest pressure usually the saphenofemoral junction, but may begin with perforating or pelvic vein

Illustration by Linda S. Nye

Superficial venous system

- Small saphenous vein
  - runs from lateral foot up posterior calf
  - variations in termination
  - segmental abnormalities
  - site of highest pressure frequently the saphenopopliteal junction, but may begin with an inter-saphenous connection or perforating vein

Illustration by Linda S. Nye
Perforating veins

- Mid-thigh Perforating Vein
- Dodd
- Proximal Calf Perforator
- Cockett
- Gastrocnemius
- Lateral thigh (lateral subdermic plexus)

Illustration by Linda S. Nye

Musculovenous pump

- Foot and calf muscles act to squeeze the blood out of the deep veins
- One way valves allow only upward and inward flow
- During muscle relaxation, blood is drawn inward through perforating veins
- Superficial veins act as collecting chamber

Illustration by Linda S. Nye

Venous Valvular Function

- Valve leaflets allow unidirectional flow, upward or inward
- Dilation of vein wall prevents opposition of valve leaflets, resulting in reflux
- Valvular fibrosis, destruction, or agenesis results in reflux
Doppler exam: Normal flow

Illustration by Linda S. Nye

Doppler: Reflux

Illustration by Linda S. Nye

REFLUX: its contribution to varicose veins

Illustration by Linda S. Nye
**Pathophysiology:** 2 components

**REFLUX**
- Dilatation of vein wall leads to valve insufficiency
- Monocytes may destroy vein valves
- Retrograde flow results in distal venous hypertension

**OBSTRUCTION**
- Thrombosis and subsequent fibrosis obstruct venous outflow
- Damage to vein valves may also cause reflux
- Both contribute to venous hypertension

The presence of both is far worse than either one alone

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**CEAP Classification**

- **“C” = Clinical**
  - C0 - no visible venous disease
  - C1 - telangiectasias or reticular veins
  - C2 - varicose veins
  - C3 - edema
  - C4 - skin changes without ulceration
  - C4a – pigmentation or eczema
  - C4b – LDS or atrophie blanche
  - C5 - skin changes with healed ulceration
  - C6 - skin changes with active ulceration

- **“E” = Etiology (primary vs. secondary)**
- **“A” = Anatomy (defines location of disease within superficial, deep and perforating venous systems)**
- **“P” = Pathophysiology (reflux, obstruction, or both)**

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**Ambulatory Venous Hypertension**

- The common denominator in the pathophysiology of venous disease
- Instead of dropping, the intravenous pressure rises during exercise and is transmitted to more superficial and distal veins
- May be due to reflux, obstruction, or both
Venous Symptoms

- Reflux and obstruction lead to congestion and dilatation of the vein walls
- Symptoms, such as aching, pain, burning, throbbing, tiredness, itching, numbness and heaviness are worse with prolonged standing or sitting, heat, progesterone states such as pregnancy/pre-menses
- Symptoms are improved with graduated compression, leg elevation, exercise

EVALUATION OF THE PATIENT WITH VENOUS DISEASE

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
- Goals of patient
Physical Examination

• Examine patient in the standing position, from the groin to the ankle
• Inspect and palpate for varicose and telangiectatic veins
• Check the medial and lateral malleolar areas for skin changes suggestive of chronic venous insufficiency (e.g., corona phlebectatica)
• Inspect the abdomen for enlarged superficial veins if ilio-femoral thrombosis is suspected

Telangiectasias

• Also known as "spider veins" due to their appearance
• Very common, especially in women
• Increase in frequency with age
• 85% of patients are symptomatic
• May indicate more extensive venous disease

Lateral Subdermic Plexus

• Very common, especially in women
• Superficial veins with direct perforators to deep system
• Remnant of embryonic deep venous system
Reticular Veins

- Enlarged, greenish-blue appearing veins
- Frequently associated with clusters of telangiectasias
- May be symptomatic, especially in dependent areas of leg

Varicose Veins – Great Saphenous Distribution

- Most common finding in patients with varicose veins
- Varicosities most commonly along the medial thigh and calf but cannot assume location indicates origin
- At least 20% of patients are at risk of ulceration

Great Saphenous Insufficiency

- Skin changes are seen along the medial aspect of the ankle
- The presence of skin changes is a predictor of future ulceration

Varicose Veins – 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

Varicose Veins with Pelvic Origins
• Begin during pregnancy
• Increased symptoms during pre-menstrual period and after intercourse
• May be associated with pelvic congestion syndrome

Skin changes suggestive of chronic venous insufficiency
- Corneal Venous Lattice (CV)
- Venous clusters (CV)
- Pigmentation (C4a)
- Atrophie blanche (C4b)
- Healed ulcer (C5)
Venous Ulceration

- Over 50% of patients have only superficial venous disease; superficial venous disease may be primary factor in 50-85% of patients
- <10% have only deep venous disease
- Results from ambulatory venous hypertension, which leads to WBC activation, ↓TcPO2, local release of proteolytic enzymes


Venous vs. Arterial Ulcers

- Venous ulcers are significantly more common
- Venous ulcers are behind malleoli; arterial ulcers are in areas of chronic pressure or trauma
- Arterial ulcers usually have a more necrotic base and are more painful
- S/S of CVI (pigmentation, etc.) or ischemia (absent pulses, hair loss, etc.) are present

Photo courtesy of John Bergan, MD
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

CONSERVATIVE TREATMENT OF VENOUS DISORDERS

Compression Therapy

- Provides a gradient of pressure, highest at the ankle, decreasing as it moves up the leg
- Reduces reflux of blood
- Improves venous outflow
- Increases velocity of blood flow to reduce the risk of blood clots
Compression Therapy

- Reduces symptoms of aching, fatigue, pain, and swelling
- Increases fibrinolytic activity
- Increases TCPO2
- Mainstay of treatment for venous ulcers
  - NOTE: Graduated compression therapy and wound care will heal venous stasis ulcers. Elimination of the reflux will reduce the recurrence.

Elastic compression stockings

- Must be graduated
- Calf high generally sufficient
- Replace q 6 months to assure proper pressure
- Available in a variety of strengths, styles, colors, and fabrics

Graduated compression is not the same as T.E.D. hose

- T.E.D.s are meant for non-ambulatory, supine patients
- T.E.D.s are indicated to decrease the incidence of thrombosis
- T.E.D.s do not provide sufficient pressure for ambulatory patients
Compression Strength | Indications
--- | ---
8-15mm | Leg fatigue, mild swelling, stylish
15-20mm | Mild aching, swelling, stylish
20-30mm | Aching, pain, swelling, mild varicose veins
30-40mm * | Aching, pain, swelling, varicose veins, post-ulcer
40-50, 50-60mm * | Recurrent ulceration, lymphedema

* Requires a prescription

Prescribing graduated compression stockings

- Measure ankle, calf, thigh for proper fit
- Disproportionate legs require custom stockings
- Medical supply companies may have stocking fitters
- Avoid using at night in elderly, diabetics, and patients with arterial disease (ie: ankle-brachial index < 0.9)

Donning compression stockings: what to advise your patients

- Method #1: Turn stocking inside out to heel and pull onto foot. Then pull the stocking up the leg
- Method #2: Put stocking on like a trouser, not like a sock
- Rubber gloves and donning devices (Easy-Slide, Butler) improve ease of donning, and thus compliance
Inelastic Compression

- Most physiologic in its effect
- Available as bandage, which requires significant skill
- "User friendly," series of nylon straps
- Good choice for elderly, diabetics, patients with arterial disease

Exercise

- Reduces symptoms such as aching and pain
- Reduces ulcer recurrence
- Speeds resolution of superficial phlebitis and DVT
- 30 minutes daily is best
- Lower extremity exercise is helpful (stay away from heavy weight-lifting or other strenuous activity)

When to treat or refer a patient with venous disease

- Symptoms (aching, pain, swelling, etc.) that are unresponsive to conservative measures such as graduated compression and exercise
- Patient is unable to tolerate compression
- Cosmetic improvement requested
- Thickening or discoloration of the skin in the ankle region: skin changes suggestive of chronic venous insufficiency
- Impending or active ulceration or hemorrhage