Chronic Venous Insufficiency — Symptoms and Treatment

In a healthy individual blood passes through the deep and superficial veins of the legs into the thighs and then the iliac veins to the inferior vena cava. The blood is pushed by the heart and also by skeletal muscle pumps as the leg muscles contract and relax. Retrograde motion is prevented by organic valves in the veins. As the valves weaken blood begins to pool in the legs and feet resulting in discoloration, vein engorgement, varicose veins, and edema.

Definition of Chronic Venous Insufficiency

Venous insufficiency — blood flows backwards

Venous insufficiency is a condition in which blood flows backwards or retrograde through the veins due to failure to the venous valves. Gravity pulls the blood to the inferior extremities resulting in edema and vein engorgement.

Both superficial and deep veins may be affected. This may be the result of thrombosis (clot formation, most commonly found in the veins of the leg and thigh), phlebitis (inflammation of a vein), congenital abnormality (lack of valve formation or valve deformity), or overuse (excess standing).
Untreated, venous insufficiency progress into chronic venous insufficiency with symptoms of leg pain, lipodermatosclerosis (inflammation of subcutaneous fat), venous stasis ulcers, and increased risk of infection. Treatment involves correcting any underlying disease and improving antegrade blood flow through compression stockings or surgery. Low pressure, superficial disease usually responds well to treatment while disease of the high pressure, deep veins is difficult to manage.

**Epidemiology of Chronic Venous Insufficiency**

**Spread of venous insufficiency**

Venous insufficiency is relatively common and is more common in the developed world. Approximately **40% of the adult population** suffers from some venous insufficiency and about **5%** of the population suffers from chronic venous insufficiency is found in about **2-5%** of the population. The condition is more common in women. Peak incidence in **women is between 40-49 years** and in men around **70-79 years**.

The elderly are at a greater risk of developing venous insufficiency. There is also increased risk with a history of deep vein thrombosis, sedentary lifestyle, smoking, obesity, or occupations involving prolonged standing with minimal ambulation.

**Etiology of Chronic Venous Insufficiency**

Venous insufficiency may result from a variety of conditions including congenitally, via wear and tear, or by the formation of thrombi. Most superficial venous insufficiency is the result of a **valvular condition of the great saphenous vein** which passes through the medial thigh and leg. The valves near the saphenofemoral junction are especially susceptible to reflux. Weak valves can fail spontaneously while normal valves weaken with excess standing, thrombosis, or trauma. Deep vein insufficiency is the result of deep vein thrombosis.
Pathology and Pathophysiology of Chronic Venous Insufficiency

There are three sets of veins in the legs:

- **The superficial veins** (great saphenous veins [media], small saphenous veins [lateral], etc.)
- **The deep veins** (from inferior to superior: anterior and posterior tibial veins, peroneal vein, popliteal vein, deep and superficial femoral veins, and finally the iliac vein the feeds into the inferior vein cava)
- **Communicating veins** that connect the deep and superficial systems

![Major Veins Serving the Lower Limbs](media)

Image: “Major Veins Serving the Lower Limbs” by PhilSchatz. License: [CC BY 4.0](https://creativecommons.org/licenses/by/4.0/)

In a healthy person blood flows inferiorly to superiorly in an antegrade fashion. Flaps of tissue in the veins act as valves that prevent the blood from flowing backwards. The leg and thigh muscles act like pumps when they contract, propelling the blood inward and upward.

Primary valve failure, where the valve is directly damaged, results from injury or thrombus formation. Secondary valve failure is the result of dilation of the vein walls. This prevents the valves from operating properly. Additionally, valves and vein walls are susceptible to damage during changes in hormone as seen in pregnancy.
Symptoms of venous insufficiency are the result of venous hypertension and the accumulation of metabolic byproducts such as carbon dioxide and lactate.

### CEAP Classification for Venous Disease

<table>
<thead>
<tr>
<th>Clinical Class</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No clinical findings or symptoms</td>
</tr>
<tr>
<td>1</td>
<td>Teleangiecstasia or reticular veins</td>
</tr>
<tr>
<td>2</td>
<td>Varicose Veins</td>
</tr>
<tr>
<td>3</td>
<td>Edema, only due to venous etiology</td>
</tr>
<tr>
<td>4</td>
<td>a) Pigmentation and/or eczema</td>
</tr>
<tr>
<td></td>
<td>b) Lipodermatosclerosis</td>
</tr>
<tr>
<td>5</td>
<td>Prior ulceration, now healed</td>
</tr>
<tr>
<td>6</td>
<td>Active ulceration</td>
</tr>
</tbody>
</table>

### Symptoms of Chronic Venous Insufficiency

#### Signs of Venous Insufficiency

Common symptoms are focused in the legs and thighs and include:

- Fatigue
- Burning
- Cramping
- Heaviness
- Formation of telangiectasia and varicose veins

The pain of venous insufficiency is quite the **opposite of arterial insufficiency**. Venous insufficiency pain is often improved by with ambulation or elevating the feet and legs or by wearing compression stockings, but in arterial insufficiency the pain is exacerbated by walking or elevating the legs, or wearing compression stockings.

As venous insufficiency becomes chronic non-healing ulcers may develop, especially around the medial malleolus. Lipodermatosclerosis changes may also occur in the legs.
which includes fibrosis and fat necrosis. Skin around the ankles may become discolored red or golden brown with the deposit of hemosiderin from the breakdown of red blood cells. Symptoms of chronic venous insufficiency include the symptoms of venous insufficiency and also:

- Edema
- Ulceration
- Dermatitis
- Cellulitis

**Diagnosis of Chronic Venous Insufficiency**

Ultrasound of the veins of the lower extremity is the preferred method to diagnose venous insufficiency. In these studies the physician is evaluating the vessels for reflux. If deep vein thrombosis is a concern then a D-dimer blood test may be useful in addition to ultrasound.

Besides ultrasound, there are other methods to visualize the deep and superficial veins of the leg and thigh involves magnetic resonance venography.

Additionally, it is possible to measure the venous refill time. In patient with normal, healthy veins it takes about two minutes to refill the leg after blood is pumped out via the skeletal muscle pumps. In patients with valve patency it will take a shorter period of time due to venous reflux.

**Differential Diagnoses of Chronic Venous Insufficiency**

Clinical pictures similar to venous insufficiency

- Cellulitis
- Squamous Cell Carcinoma
- Stasis Dermatitis
- Traumatic Ulcers

**Therapy of Chronic Venous Insufficiency**

**Treatment of venous insufficiency**

*Artificial compression* is the treatment of choice for venous insufficiency or chronic venous insufficiency. Graduated compression stockings with a rating of 30-40 mm Hg are sufficient. Superficial varicose veins can be ameliorated surgically. Deeper veins can be bypassed to remove the points of excess reflux, but there are many complications associated with this type of surgery. There is no effective treatment involving medication. Deep vein insufficiency is difficult to treat.

Additionally, in the presence of severe venous insufficiency or venous stasis ulcers an Unna boot may be applied to the legs. This is a special gauze that is impregnated with medication including zinc oxide and calamine that should help promote healing and reduce some symptoms.
Review Questions

The solutions are located below the references.

1. Venous ulcers may be found on which part of the leg?
   A. Medial malleolus
   B. Lateral malleolus
   C. Peripheral leg
   D. Popliteal fossa
   E. Dorsal foot

2. Arterial stasis disease may be distinguished from venous stasis disease in that the former...
   A. ...is improved with activity.
   B. ...is improved by elevating the legs.
   C. ...results in pain with activity.
   D. ...results in pain when elevating the legs.
   E. Both C and D.

3. The first line, and most effective, for venous insufficiency is:
   A. ...surgical ablation.
   B. ...exercise.
   C. ...Aspirin.
   D. ...compression stockings.
   E. ...venous bypass.

References


Correct answers: 1A, 2E, 3D