Chronic Venous Insufficiency — Symptoms and Treatment

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In healthy individuals, blood flows through the deep and superficial veins of the legs into the thighs, and through the iliac veins into the inferior vena cava. The blood is pumped by the heart and also by the contraction and relaxation of muscles in the leg. Retrograde motion is prevented by organic valves in the veins. As the valves weaken, blood accumulates in the legs and feet resulting in discoloration, engorged and varicose veins, and edema.

Definition of Chronic Venous Insufficiency

Venous insufficiency — blood flows backward

Venous insufficiency is characterized by retrograde blood flow through the veins due to failure of the venous valves. Blood is drawn to the lower extremities under the force of gravity resulting in edema and venous engorgement.

Both superficial and deep veins may be affected as a result of thrombosis (clot formation most commonly in the veins of the leg and thigh), phlebitis (venous inflammation), congenital abnormality (lack of valve formation or valve deformity), or overuse (excessive standing).
When left untreated, venous insufficiency progresses into a chronic phase with symptoms of leg pain, lipodermatosclerosis (inflammation of subcutaneous fat), venous stasis ulcers, and increased risk of infection. Treatment entails correction of the underlying disease and improved antegrade blood flow via compression stockings or surgery. Under low pressure, the superficial disease usually responds well to treatment while the disease associated with deep veins under high pressure is refractory to treatment.

Epidemiology of Chronic Venous Insufficiency

Spread of venous insufficiency

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

The elderly are at a greater risk of developing venous insufficiency. The risk is increased in individuals 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 congenital factors, via wear and tear, or via formation of thrombi. Most superficial venous insufficiency is attributed to **valvular conditions of the great saphenous vein**, which traverses 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 results from deep vein thrombosis.
Pathology and Pathophysiology of Chronic Venous Insufficiency

There are 3 sets of veins in the legs:

- **Superficial veins** (for e.g., great saphenous veins (media) and small saphenous veins (lateral))
- **Deep veins** (from inferior to superior: anterior and posterior tibial veins, peroneal vein, popliteal vein, deep and superficial femoral veins, and the iliac vein that feeds into the inferior vena cava)
- **Communicating veins** that connect the deep and superficial systems

In a healthy person, blood flows inferiorly to superiorly in an antegrade fashion. Flaps of tissue in the veins act as valves that prevent retrograde flow of blood. The leg and thigh muscles act like a pump 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 may result from the dilation of the vessel walls, which prevents the efficient functioning of the valves. Additionally, valves and vessel walls are susceptible to damage during hormonal changes 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>Telangiectasia 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>1. Pigmentation and/or eczema</td>
</tr>
<tr>
<td></td>
<td>2. Lipodermatosclerosis</td>
</tr>
<tr>
<td>5</td>
<td>Healed ulcers</td>
</tr>
<tr>
<td>6</td>
<td>Active ulcers</td>
</tr>
</tbody>
</table>

CEAP: C = class; E = etiology; A = anatomic; P = pathophysiology

### Symptoms of Chronic Venous Insufficiency

#### Signs of venous insufficiency

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

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

The pain associated with venous insufficiency is the opposite of arterial insufficiency. Pain in venous insufficiency is often improved with ambulation or elevation of the feet and legs or by wearing compression stockings. However, in arterial insufficiency, the pain is exacerbated by walking or raising the legs, or wearing compression stockings.
As venous insufficiency becomes chronic, non-healing ulcers may develop, especially around the medial malleolus. Changes associated with lipodermatosclerosis including fibrosis and fat necrosis may also occur in the legs. The skin around the ankles may become discolored, red or golden brown following accumulation of hemosiderin deposits resulting from the breakdown of red blood cells. Symptoms of chronic venous insufficiency include symptoms of venous insufficiency in addition to the following:

- **Edema**
- **Ulceration**
- **Dermatitis**
- **Cellulitis**

**Diagnosis of Chronic Venous Insufficiency**

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

In addition to ultrasound, other methods such as magnetic resonance venography are available to visualize the deep and superficial veins of the leg and thigh.

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

**Differential Diagnosis of Chronic Venous Insufficiency**

- **Clinical conditions 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 treated surgically. Deeper veins can be bypassed to remove the points of excess reflux, but this surgery may be associated with multiple complications. **No effective medical treatment is available.** 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 promotes healing and reduces 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 the most effective treatment for venous insufficiency is...
   A. ...surgical ablation.
   B. ...exercise.
   C. ...Aspirin.
   D. ...compression stockings.
   E. ...venous bypass.

References


Correct answers: 1A, 2E, 3D