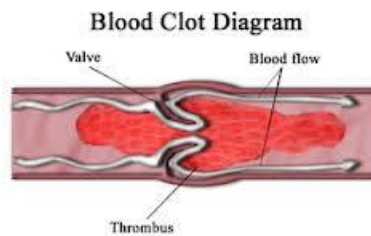


## Chronic Venous Insufficiency and the Effects on the Lymphatic System

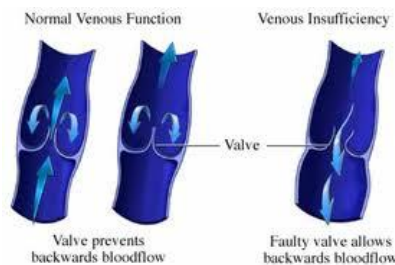
Chronic venous insufficiency (CVI) is an advanced stage of venous disease that occurs when the inner lining of the veins and/or the valves located within the larger veins are not working sufficiently, causing venous blood to collect or “pool” in the veins (venous stasis).



As discussed in the last entry, the blood pressure inside the thin walled-veins is considerably lower than the pressure in the arteries. A system of valves inside the larger veins prevents pooling of venous blood in the lower extremities and helps to ensure transporting the venous blood back to the heart efficiently. A sufficient return of venous blood to the heart would not be possible without the help of the muscle and joint pumps, diaphragmatic breathing and the suction effect of the heart during its relaxation phase (diastole). Together with a functioning valvular system in the veins, these supporting mechanisms propel the venous blood back to the heart.



Chronic venous insufficiency develops most commonly as a result of blood clots in the deeper veins of the legs. This condition, known as deep venous thrombosis (DVT), results in changes in the fluid dynamics in the veins and causes the pressure in the veins to increase and the system of valves to become insufficient. If the venous blood pressure stays elevated over long periods of time, chronic venous insufficiency develops. Chronic venous insufficiency resulting from DVT is also known as post-thrombotic syndrome; as many as one of every three individuals affected by DVT will develop this problem within five years after diagnosis (1).

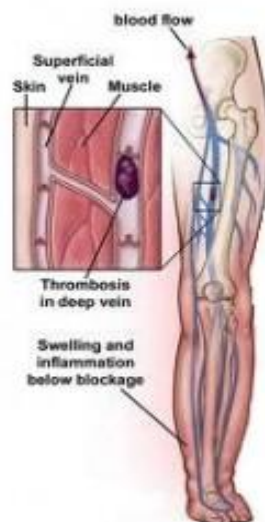


## Symptoms and signs of CVI

The problems associated with CVI do not disappear without treatment and the complexity of treatment increases as the disease progresses. Untreated CVI can lead to serious complications, to include lymphedema and early diagnosis and treatment is of utmost importance. A specialized physician should be consulted as soon as the following symptoms are present:

- Swelling in the lower legs and ankles, especially after extended periods of standing. This is often the first sign and caused by the pooling of venous blood
- Heavy, tired, aching or restless legs
- New varicose veins
- Leathery-looking skin on the legs
- Flaking or itching skin on the legs or feet
- Stasis ulcers (or venous stasis ulcers) generally around the ankles, that won't heal

These symptoms are caused by a condition known as ambulatory venous hypertension, which is itself a result of obstruction inside veins, retrograde (“backward”) venous flow (reflux), or a combination of these. The deficient valves in the veins in CVI fail to prevent the retrograde flow of venous blood during muscle pump activity, specifically the activity of the calf musculature during walking (ambulatory). Muscle activity in the legs applies outside pressure to the veins and a functioning system of valves forces the venous blood upward and towards the heart while walking and prevents backflow. In CVI the blood is not only forced upward towards the heart during muscle activity, but also “backwards” causing the pressure in the veins of the lower leg to increase even more (ambulatory venous hypertension).



This pathological increase in pressure subsequently has an effect on the blood capillaries, and more fluid is filtered from the blood into the tissues. It is the lymphatic system's responsibility to compensate for the increased amount of tissue fluid by increasing its activity; this is also known as the lymphatic safety function. If the lymphatic system, despite working to its maximum capacity, is not able to cope with the additional fluid, edema develops in the leg.

In the initial stages this swelling may recede with elevation and rest, but over time and without adequate treatment (compression, elevation, exercise), the constant strain on the lymphatic system may lead to damage to the lymphatic vessels, leading to reduction of its transport capacity. This condition, described as combined venous and lymphatic insufficiency, has serious consequences, and without treatment the symptoms associated with CVI and ambulatory venous hypertension will gradually worsen, and the condition will progress through the following stages.

### **Stage 0 – subclinical stage**

As long as the lymphatic system is able to compensate for the increase in tissue fluid resulting from venous hypertension, affected individuals remain free of edema, but may experience other symptoms typically associated with CVI (see above).

### **Stage 1 – phlebo-lympho-dynamic insufficiency (Edema)**

The lymphatic system works to its maximum capacity, but is unable to drain the elevated fluid resulting from the ambulatory venous hypertension. The lymphatic system is still healthy, but experiences overload, which is also known as dynamic insufficiency of the lymphatic system. Edema develops over the course of the day.

In the early stages the lymphatic system is able to “catch up” with the excess fluid in the tissues during rest at night and the edema tends to decrease or completely recede during night time rest. At night the gravitational forces are inactive and the pressure in the venous system returns to normal values in the supine position.

Proper treatment approaches in this stage include elevation, exercises and compression.

### **Stage 2 – phlebo-lympho-static insufficiency (Lymphedema)**

Blood capillaries with elevated pressure values and lymph vessels working on their maximum capacity that remain without appropriate intervention and treatment for extended periods of time will eventually suffer damage. Red blood cells (erythrocytes) leave the blood capillaries through their stretched walls, causing the skin to become reddish-brown due to deposits of tissue storage iron (hemosiderin). Subsequent to high pressure inside the lymphatics, the walls of lymph vessels becomes fibrotic and the valves inside larger vessels become inefficient, which causes impairment of the lymphatic system to a point so severe that it is unable to perform its basic functions. This results in an accumulation of not only fluid, but also protein in the tissues.

Lymphedema will develop as a result of the venous pathology, and its symptoms are exacerbated by the symptoms associated with CVI. The lymphedema appears initially smooth and is pitting. Without treatment it progresses into a more fibrotic stage (see stages of lymphedema).



As discussed, early diagnosis and treatment is of utmost importance to prevent further complications. Complete Decongestive Therapy is indicated treatment approach in this stage.



**Stage 3**

Severe changes in the skin and subcutaneous tissues are typical in this stage. Ulcerations may develop as a consequence of reduced oxygenation and nutrition of the tissues. In addition to lymphedema and leg ulcers, symptoms of lipodermatosclerosis are present, which include:

- Pain
- Hardening of the skin
- Localized thickening
- Moderate redness
- Increased pigmentation
- Small white scarred areas
- Varicose veins

In addition to Complete Decongestive Therapy, other treatment approaches, such as wound care, may become necessary.

(1)[http://dermatology.cdlib.org/143/case\\_presentations/postthrombotic\\_syndrome/vereecken.html](http://dermatology.cdlib.org/143/case_presentations/postthrombotic_syndrome/vereecken.html)