

Chronic Venous Insufficiency (CVI)

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Chronic Venous Insufficiency or CVI is the failure of the valves inside the veins to shut fully and force the blood up to the heart. Instead the valves stay open and the blood falls down in the leg causing the leg to swell. Initially, the swelling goes away when the legs are elevated because the lymphatic system helps the veins move the fluid in the system back to the heart. The lymphatics kick into overdrive and help prevent swelling initially in CVI, but over time (decades later) this system fails as well. Once the lymphatics and valves of the veins have failed, the swelling no longer goes away and eventually the skin starts thickening and the swelling turns hard. The skin color usually turns a reddish-brown color initially and then the color turns purple eventually. More veins are noted on the skin. This problem is typically noted primarily below the knees.

The most common cause of CVI is a poorly healed thrombosis or blood clot. **The only technique beneficial in preventing edema after a blood clot is compression.** According to Professor of Medicine, Michael Földi, M.D., of the Földi Clinic for swelling disorder treatment in Hinterzarten, Germany, with adequate compression a person will be able to control the swelling and will prevent a wound.

A blood capillary is the very smallest blood vessel such as a vein or artery. “Blood capillary pressure” is the force that is exerted on the inside of the vessel wall by the blood. This is similar to the pressure that the water exerts on the inside of a garden hose when it is turned on. Over a long time, with increased blood capillary pressure the wall of the blood capillary will be stretched and becomes more permeable--the holes get bigger and more holes develop. The holes get so big the red blood cells can now leave the blood capillary and move out into the interstitium. The interstitium is the empty space that surrounds the vessels. Hemoglobin can now come out to the interstitium with red blood cells. Hemoglobin breaks down and is converted to the protein hemosiderin which has iron in it. The first sign visible of CVI are tiny red dots called petechia on the foot and lower leg. Later a brown hemosiderin “stain” appears on the lower legs. The lower leg can be red or eventually purple.

In an individual with CVI, the blood pressures in the lower leg are the same as in a normal leg both when LYING on your back and in STANDING WITHOUT MOTION. However, with WALKING, the venous pressure remains very high at 108 mmHg (when normal is only 30 mmHg). The muscle pump of the calf normally helps to pump the fluid out of the leg and propel it back to the heart, which reduces the blood pressure in the lower leg. However, instead of moving up toward the heart—the increased pressure left in the leg is now forced out toward the skin=“blow-out”. Damaged veins eventually result in valve insufficiency. The valves of the veins normally close very tightly and help propel the fluid upward toward the heart. Because the muscle and joint pump of the calf is unable to reduce this very high venous blood pressure in valve insufficiency—a resistance or backup of fluids occurs in the venous system. Anything blocking the venous system increases venous blood pressure and causes congestion—similar to a traffic jam.

Over time without treatment using compression stockings this condition worsens. Due to blow out, skin cells eventually die and venous stasis ulcers can develop. Compression is mandatory in treating CVI as compression prevents the dilatation of veins under ambulatory conditions and during sitting. Ambulatory venous hypertension is drastically reduced with compression. Starling's Law of equilibrium: Tissue pressure is increased and effective ultra-filtration pressure is decreased--working to prevent edema.

“Tissue pressure is increased”=stockings push on the outside of the leg

“Effective ultra filtration pressure is decreased”=less fluid is escaping into the interstitium and more is staying in the blood vessels.

After CVI is present for a long time without compression--fibrosis of the skin occurs. Fibrosis is hardening of the skin and development of scar tissue. Dr. Földi prefers the term “DERMATO-LYPO-SCLEROSIS”: Dermato=skin; Lypo=fat; Sclerosis=hardening. The tissue can feel waxy due to the fatty deposits. Fibrosis=tissue is much harder than normal.

There will not necessarily be significant swelling present with CVI. Valves that are insufficient in veins do not close fully. With varicosities the valves do not even come close to touching due to the increased size of the vessel. Valve insufficiency is present but edema is not seen initially secondary to safety valve function of lymphatics and their ability to compensate. The lymphatic safety valve function is basically a revving up of the lymphatics to accommodate a greater lymphatic load—carrying more fluid back to the heart and out of the tissue spaces, which prevents edema.

Venous problems get bigger and bigger over time without compression and eventually healthy lymphatics have dynamic insufficiency--net ultra filtrate is much higher and finally edema results. The lymphatic safety valve function fails and a dynamic insufficiency of this system results. When the skin is thicker and hardness develops in later stages of CVI, the lymphatic system has failed and a secondary lymphedema has developed. (Please refer to handout describing lymphedema in detail).

CLINICAL STAGES OF CVI:

STAGE I: Venous insufficiency-CVI

STAGE II: Phlebolymphodynamic insufficiency-lymphatics are healthy but unable to handle load

STAGE III: Phlebo lymphostasis-increased load and damaged vessels-safety valve insufficiency.

TREATMENT: In stage 1 the ONLY treatment necessary is compression with adequate compression stockings. These must be worn daily. The patient does not need to wear these to bed at night. Only when up walking around.

In stage 2 and 3 of CVI, treatment with Complete Lymphedema Therapy (CLT) is beneficial to mobilize the protein molecules in the interstitium, which is causing the proliferation of scar tissue which causes skin changes and fibrosis. Following treatment with CLT stage 1—the phase of decongestion, the patient is fit with compression stockings, which are worn lifelong. Once lymphedema has developed the skin loses elasticity and without compression the swelling will return within 3 days according to Dr. Földi. Research shows that a wound will return within 36 months of not wearing adequate compression.