



THE VEIN INSTITUTE  
AT SOUTHERN SURGICAL ARTS

## FACT SHEET

### LOWER EXTREMITY VENOUS ANATOMY

Arteries convey oxygen-rich blood from the heart to the legs. Veins return depleted blood from the legs back to the heart. The lower extremity venous anatomy is divided into the deep venous system and superficial venous system. Numerous perforator veins connect the two venous systems. The deep system consists of veins that are located deep within the legs (next to the bones) and are surrounded by muscles and fascia. Deep veins are well-supported and naturally resistant to dilation and valvular failure. Most vein patients therefore have normal deep veins. This is fortunate because the deep venous system is responsible for 90% of lower extremity blood return.

The main superficial veins are the great saphenous and small saphenous veins. These superficial veins reside just below the skin and are not effectively supported by muscle or fascia. They are, therefore, prone to dilation and valvular failure. When the valves fail, the blood falls back to the feet rather than returning to the heart (known as superficial venous insufficiency). Most venous insufficiency occurs in the superficial venous system.

#### *Calf Muscle Pump*

The deep leg veins run within the calf muscles. Each time the calf muscles contract, they squeeze the deep veins, emptying these veins of blood. Because of the one-way venous valves, the blood can only go “up” or back toward the heart. Thus, the calf muscles and the veins within them form a calf muscle pump. The calf muscle pump provides upward propulsion to overcome the downward gravitational force and send venous blood back to the heart.

Calf muscle pump problems generally begin when the delicate valves in the deep veins malfunction. These faulty valves allow blood to reflux and pool in the veins,

resulting in deep venous insufficiency. There are currently no good procedures to correct this problem. Fortunately, the calf muscle pump is extremely durable and resistant to malfunction. Fewer than 10% of our patients have calf muscle pump dysfunction.

The calf pump is idle when you stand still or sit with your legs in a dependent position. In these positions, gravity causes blood to pool (even in normal legs). This pooling of blood makes your legs feel tired, heavy and achy. Prolonged standing still or sitting with legs dependent (such as at your desk or computer) are therefore bad for your veins.

### VENOUS INSUFFICIENCY

All leg veins have numerous one-way valves that prevent blood from flowing backwards or refluxing. Leg vein problems generally begin when these delicate valves become weak and malfunction. Faulty valves allow blood to reflux and pool in the veins, leading to increased pressure within the veins. The increased pressure is transmitted to the tributary veins, the capillaries, and the tissues drained by the diseased vein. This condition is the most common form of venous disease and is referred to as venous insufficiency.

Venous insufficiency can occur in the deep venous system (usually as a result of deep venous thrombosis), or in the superficial venous system (usually from dilation of the veins). Venous Insufficiency is typically progressive. In addition to causing varicose veins, it can lead to pain, swelling, restless legs syndrome, brown pigmentation, bleeding, and formation of venous leg ulcers. Early treatment of this process can stop the natural progression of this disease and reduce symptoms to achieve the best possible functional and cosmetic results.

## **TYPES OF DISEASED VEINS**

### *Spider Veins*

Spider veins (a.k.a. telangiectasias or venulectasias) are tiny abnormally dilated blood vessels just beneath the skin surface. They are filled with blood, which makes them visible through the skin. They are red, blue, or purple in color and can vary from a single dot or line to dense mats or clusters.

Spider veins can cause symptoms such as itching, burning, heaviness, and fatigue in the legs. Although they may be symptomatic, spider veins are considered by Medicare and private insurance companies to be a cosmetic problem rather than medical condition. The primary concern with spider veins is their unsightly, embarrassing appearance that may interfere with normal physical or social activities.

Spider veins are often caused by underlying venous insufficiency and can be an indication of diseased large vessels underneath. Dr. Gardner may use an ultrasound or vein lite to search for larger diseased veins deeper within your legs that may be causing your spider veins. If venous insufficiency is diagnosed, it needs to be treated; or spider vein treatment will be ineffective.

The tendency to develop spider veins is largely hereditary, and there is not much you can do to prevent them. Support hose and exercise are helpful for symptoms, but the veins keep growing. Pregnancy and hormonal variations hasten their appearance.

### *Reticular Veins*

Reticular veins are darker veins that form bluish networks that criss-cross over the thighs and lower legs. They are considered a cosmetic difficulty rather than a medical condition. They are larger than spider veins and “feed” spider veins. Ignoring them when treating spider veins can lead to less than optimal results.

### *Varicose Veins*

Varicose Veins are permanently enlarged veins located beneath the skin. They become dilated and tortuous in response to abnormally high pressures seen in venous insufficiency. They are typically blue or purple, measure 3-8 mm in diameter, and have a twisted, ropy appearance.

Varicose veins are caused by superficial venous insufficiency. As described above, superficial venous insufficiency is due to faulty one-way valves that do not close properly and allow blood to leak back with gravity and pool in the saphenous veins and their tributaries. This

pooling leads to abnormally high venous pressures within the malfunctioning veins, which causes them to distend and balloon out, thus becoming varicosities.

One of the biggest contributing factors in the development of varicose veins is heredity or family history. Other risk factors include jobs that require prolonged standing or sitting, pregnancy, and hormonal influences. The incidence increases with age.

Varicose veins are irreversibly damaged and do not assist in blood circulation (in fact they actually impair blood return to the heart). The body will not miss them when they are removed, and they are not suitable for use during heart bypass procedures.

## **YOUR DIAGNOSIS**

In most cases, the cause of a patient's venous disease can be determined by a single medical history and physical examination as well as thorough evaluation using non-invasive modalities. The key to effective treatment of venous disorders is accurate diagnosis. A comprehensive Non-Invasive Vascular Laboratory is on site and staffed by Robin Long (a Registered Vascular Technologist with extensive experience in diagnosing arterial and venous disease). The Venous Duplex Scan evaluates the deep and superficial veins in the leg and locates the refluxing valves and diseased veins; thus creating a “road map” of the veins requiring attention.

## **TREATMENT OPTIONS**

The Vein Institute utilizes many state-of-the-art modalities to treat veins of all sizes. Dr. Gardner carefully evaluates and confers with each patient to formulate an individualized treatment plan. The goal of medical treatment is to eliminate venous insufficiency and restore proper venous circulation by eliminating refluxing veins, varicose veins, and spider veins. The choice of medical treatment depends upon the type, size, location, and depth of your diseased veins.

### *Conservative Treatment*

Conservative treatment refers to non-invasive options such as routine exercise, weight loss as indicated, frequent leg elevation, avoidance of prolonged standing, and use of Class III graded compression stockings. The objective of the conservative approach is to support the venous circulation of the legs in order to minimize symptoms. This treatment plan is not corrective and will not “heal” or “repair” any veins that have already become diseased.

### *Vein Stripping*

Vein stripping is the surgical removal of a diseased vein. Dr. William Keller first described inversion stripping of the great saphenous vein to treat varicose veins in 1905. This rather excruciating operation has changed little over the last 100+ years. It requires hospitalization, general anesthesia, and a protracted convalescence. Postoperative pain and swelling is often severe and demands 4-6 weeks leave from work.

Despite the rather severe morbidity, vein stripping fails to relieve the patients' venous reflux 50-65% of the time. Varicose vein recurrence is therefore quite common after stripping.

Vein stripping has earned a bad reputation, and justifiably so. Fortunately, these operations are largely of historical interest only; and have been replaced by recently developed minimally-invasive procedures including endovenous laser ablation.

### *Endovenous Laser/Radio Frequency Ablation*

The newest technologies available for the treatment of venous insufficiency or varicose veins are endovenous laser/RF ablation. Endovenous laser/RF ablation are minimally-invasive and performed under local anesthesia with I.V. conscious sedation in The Vein Institute (thus avoiding hospital and anesthesiology charges). The procedure takes about an hour. Most of our patients report only mild intraoperative discomfort, as they are "feeling groovy" from the I.V. sedation. Postoperative pain is variable and depends largely on the amount of work required corresponding to the extent of your disease. Many patients take only Advil (Ibuprofen), foregoing the prescribed Ultram/Hydrocodone. Patients are up walking 5-10 minutes after the procedure and generally back to work or normal activities in 2-3 days.

Endovenous laser/radiofrequency ablation is performed under ultrasound guidance. Patients are sedated (but remain awake) and given lidocaine tumescent anesthesia. A laser fiber/RF catheter is threaded into the diseased saphenous vein through a tiny (2mm) needle incision. The fiber/catheter is directed to the uppermost portion of the vein, the laser/catheter is activated, and the fiber/catheter is withdrawn. As the laser fiber/catheter is removed, it gently heats the lining of the vein and safely seals it shut. The instant that the diseased vein is sealed shut, the blood that had been refluxing within it is redirected to the healthy deep veins and thus returned to the heart. After the laser/RF ablation,

the treated vein slowly dissolves and is absorbed by your body. The varicose veins that were created by the diseased saphenous veins are then easily and permanently treated.

Compression stockings are applied when the treatment is complete. They are worn for the next 2 weeks to assist in resolution of the treated saphenous and varicose veins. A postoperative ultrasound is performed within the first week to confirm successful ablation of the treated veins and the compression stockings are worn daily for the next two weeks.

### *Ambulatory Micro-Phlebectomy*

Ambulatory micro-phlebectomy utilizes minimally invasive techniques developed in Europe to eliminate large, bulging varicose veins. Affected veins are pulled up and removed through 2mm incisions that do not require sutures. This procedure is performed in The Vein Institute under local anesthesia with I.V. conscious sedation. It can be employed when the saphenous vein is not diseased or has been previously dealt with.

Postoperative pain is minimal and can be controlled with a mild pain reliever. Moderate bruising will appear, but usually resolves within a few weeks. Most patients are back to work and their normal activities in two days.

### *Sclerotherapy (a.k.a. I.V. Chemical Ablation)*

Sclerotherapy is a safe and effective method of treating varicose veins, spider veins, and reticular veins. A tiny needle is used to inject the diseased vein with a solution that causes irritation of the lining of the vein. The veins collapse and are gradually reabsorbed by the body and disappear. Blood flow is re-routed to the remaining healthy veins and normal circulation is restored. Because no incisions are created, sclerotherapy usually does not leave a scar. Bruising and pigmentation occur after sclerotherapy. Bruising usually disappears in one to two weeks. Although pigmentation almost always fades completely, it can last for several months. Scarring and other complications have been reported, but are quite rare.

A single sclerotherapy treatment session may involve one to many injections. The number of treatment sessions varies greatly and depends on the type and number of veins treated, as well as the level of cosmetic perfection desired. Compression stockings are applied after the treatment is completed.