

CHAPTER 16

SURGICAL THERAPY FOR CHRONIC VENOUS INSUFFICIENCY

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Introduction

Varicose veins have been documented from before 2000 B.C. Egyptian papyrus writings trace the use of **compression** bandage to treat **venous ulcers** from the time of the Pharaohs. Treatment for **varicose veins** can be found in writings in 1465 A.D. in a Turkish surgical text. The modern surgical treatment of **varicose veins** started with Frederick Trendelenburg in 1891 when he showed how to tie off the **greater saphenous vein** (largest vein outside the muscle and located in the fat just under the skin) to prevent an abnormal backward flow of blood into the lower leg. The normal method of **vein stripping** (actually pulling the **great saphenous vein** out of the leg) started in the early 20th century by Keller and Mayo and changed very little for many years. Recently, a new way of stopping flow in the **great saphenous vein** to prevent backward flow of blood involves destroying the **vein** while leaving it in place. The procedure is **venous ablative surgery** and uses heat (**laser** or sound waves (**radiofrequency**)) or strong burning drugs (**sclerotherapy**) to destroy the **saphenous vein** without its removal).

Definitions

The normal way the **saphenous vein** works is by allowing blood to flow from the lower leg to the heart (a simple pipe or conduit use) in addition to having **valves** that stop the backward flow of blood once it is push forward by muscles or gravity. This provides a one way direction for blood flow out of the leg. It prevents puddling of blood in the leg which would otherwise be the normal effect of gravity when a person stands. One can well image the swelling that would happen in the leg if such a plumbing system was not in place. Unfortunately, **valves** can become damaged after injury with the result that blood flow backward in the pipes, pools in the lower leg and causing swelling as well as other problems. The term used by doctors for this abnormal state is **chronic venous insufficiency (CVI)**. One other sign that there is abnormal backward blood flow in the lower leg is the presence of **varicose veins** which are often seen as dilated **vein** branches coming off the **saphenous vein** easily and seen beneath the skin (**Figure 1**). They can be seen as distended irregular bluish colored **veins** going down the leg. Other symptoms seen with **varicose veins** and **CVI** are leg aching, throbbing and progressive swelling in the calf and ankle. **Varicose veins** are often considered unsightly from a cosmetic point of view. If no treatment is provided, the spectrum of symptoms can be very little to pronounced with more severe stages of **CVI** leading to bad skin damage and even **ulcers** (open wounds) usually seen above the ankle on the inside of the leg.

Economics of Chronic Venous Insufficiency

CVI and **varicose veins** are the most frequent blood vessel abnormalities occurring in people and affects approximately one third of the population. Both men and women are affected and in near equal number (about forty percent of men and thirty percent of women). Twenty to forty year old people in the peak of their productive lives are first burdened by the disability produced by **venous insufficiency**. The result can be lost time from work or from their otherwise active lifestyles. It has been estimated that ten percent of the people are stopped from active employment at some time during their treatment for **CVI**. **Venous disease** has been projected to account for up to two percent of the total health care cost in the United Kingdom alone.

Presentation

The typical patient arrives in the doctor's office with complaints of leg symptoms that include pain, swelling, throbbing and fatigue with or without the presence of a leg **ulcer**. The duration of symptoms is usually progressive from several months to years with the severity of symptoms reflecting the length and degree of **CVI**. A complete history and physical is necessary to identify unusual signs of **varicose veins** and **venous insufficiency**. The history should document any prior **venous thrombosis (blood clotting)**, history of previous leg **ulcers**, and occurrence of symptoms in other family members and if female, the number of pregnancies and whether **varicosities** near the vagina exist. Additional pertinent history should include current medications, smoking history, and any potential drug allergies. This information is vital if consideration for surgical treatment becomes necessary.

Examination

The patient is best examined in the standing position with the leg slightly flexed and body weight supported by the opposite leg. Feeling for any bulging of the **vein** at the level of the groin or with backward flow of blood heard by using sound wave blood movement (Doppler study) with standing or during a cough can suggest abnormal **venous function (venous insufficiency or venous reflux of blood)**. Additional feeling of the groin and thigh can often determine how far the backward flow of blood goes down the leg and can locate any enlarged **veins (varicose veins)** that lie underneath the skin. Currently, Doppler ultrasound machines in the **vascular lab** are used for complete assessment of all the **veins** in the leg both deep in the muscle and those lying just under the skin for both **reflux** and the location of **varicose veins**. As significant variation can exist between individuals from one leg to the other, **venous Doppler ultrasound** is invaluable to identify the pathway of drainage for **venous reflux** in directing appropriate surgical treatment. Additional tests of **venous disease** can provide more information about the extent of **reflux**, however direct **venous imaging with Doppler ultrasound** provides both anatomic detail as well as direction of blood flow.

Management

The treatment of **saphenous vein reflux** and **varicose veins** depends on many factors. Mild and moderate symptoms can be successfully treated with the use of **compression stocking** therapy (stockings that compress the leg because of their elastic design). Best results are obtained when the stockings are worn while the patient is standing or sitting during the day. Unfortunately, how faithfully the patient uses the stocking (compliance) is made less likely by the inconvenience of wearing the stockings as well as the vanity of using the stockings on a regular basis. **Compression stocking** therapy may also be impractical for those patients in which fashion is a major concern. For these reasons, many patients fail to use their stockings in any standard way. Treatment options for stocking failures or noncompliance thus may prompt more invasive treatments for **varicose veins** and **CVI**. There are four treatments that may be chosen.

Vein Stripping

The traditional surgical treatment for **venous insufficiency** of the **saphenous vein** involves two primary goals. The first is to eliminate backward blood flow (**reflux**) in the **saphenous vein** and its tributaries. The second is to remove unsightly and protruding **varicose veins** through tiny incisions (**phlebectomy**). Improvement to the method over the years has allowed most procedures to be done on an outpatient basis. **Saphenous vein stripping** involves making a small incision at the level of the groin to expose the beginning of the **saphenous vein** and its branches, and a separate incision at or near the level of the knee. A **wire stripper** is then inserted into the **vein** and the **vein** is disconnected at these two incisions. The **vein** is attached to the **wire stripper** and is pulled (ripped) from where it lies. Thus the term “**stripping**” of the **vein** was what it came to be called. Small separate skin cuts (incisions) over the areas of abnormal **vein** dilation are made along the thigh or calf for removal of branch **varicose veins** that were not attached to the main trunk of the **saphenous vein** or where not removed at the time of stripping. **Compression** bandaging is used from the ankle to the level of the thigh for several days to reduce the amount of bruising and discomfort from the procedure. The patient is allowed to walk to comfort levels immediately after surgery with instructions for leg elevation when discomfort develops and when retiring to bed. This procedure can be office based using local anesthesia but more normally has been performed in an outpatient setting with either a general or spinal anesthetic. Recovery is fairly prompt with return to normal function within ten to fourteen days.

Vein Ablation

Three additional treatment regimens have become popular within the last ten to fifteen years as a replacement for traditional **vein stripping**. The use of a laser machine or a **radiofrequency** catheter can each be used to create heat which then clots and eventually scars the **saphenous vein** from within. Each device is inserted into the **saphenous vein** at or near the level of the knee by a small needle puncture of the vein guided by **ultrasound**. A wire is passed up the vein to the level of the groin followed by a special

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wire like device which will deliver the heat. Using sound wave pictures (**ultrasound** imaging) the correct position of the treatment catheter is confirmed. A generous amount of dilute numbing medicine (anesthetic) solution is then injected by needle around the area of the saphenous vein from the thigh to the level of the knee. This provides for comfort relief and serves as an insulator so that surrounding fat and skin are not burned. The **laser** or the **radiofrequency** probe is then activated. The heat generated produces a clotting and scarring of the **saphenous vein** from the level of the groin to the knee as the catheter is pulled back and eventually out. The heat destroys the inner lining of the **vein** (**endothelium**) and causes scarring of the **vein** lining and thus closes the **vein** so blood no longer flows. Advantages include few skin cuts, the ability to do the procedure in an outpatient or office setting. There is no need for major anesthetic and there is a more rapid return to normal activity level.

Using a needle to push a drug mixed with air (**foam sclerotherapy**) into the vein which can rapidly irritate, burn and scar the inside of the **saphenous vein** without cutting the skin is another way of stopping backward flow in the **vein**. **Ultrasound** again is used to direct where the drug goes in the **vein**. The drug (**sclerosant**) used is a detergent that is very damaging to the inside of the **vein**. When mixed vigorously with air, the **sclerosing agent** becomes frothy or foam like. This solution is then injected directly into the **vein** and floats into **vein** branches as well. The degree of spread is dependant on the amount (volume) of **foam sclerotherapy** drug used. Care must be taken to avoid foam injection into the deeper **veins** of the leg. This technique is also an office based procedure, well accepted by patients, and can be easily repeated if necessary.

Complications

Complications (problems) occurring **after surgery** are usually relatively minor. These include nonhealing of any cuts to the skin (incisional wound breakdown), infection, or clots occurring in the **deep veins** (development of **deep venous thrombosis**) of the leg, loss of feeling (sensory loss) of skin areas from nerves lying close to the **veins** that may be injured. Recurrence of the symptoms of **CVI** or of **varicose veins** has happened when patients have been followed for long enough (more than 10 years). In these clinical studies, recurrence has been reported to occur in up to twenty or thirty percent of people treated. Many things can lead to a return of symptoms such as the method of treatment, advancement of the disease, and the development of entire new problems. Success, however, is seen in most patients with recurrence of symptoms happening slowly over ten to twenty years.

Problems seen after **vein ablative surgery** include burns, nerve damage and **deep vein thrombosis**. An extremely low but rare complication of stroke has occurred with **foam sclerotherapy** injections in some individuals having congenital heart defects. Nonetheless, **vein ablative techniques** have become popular because the treatment is less invasive and can be less painful with a more rapid return to a full level of activity. The recurrence of **CVI** after **vein ablation** has not been as well studied as **vein stripping**. These techniques have been successful in allowing **vein** care to be delivered in an office based or non-hospital setting.

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Conclusions

The superficial leg **veins** can allow the backward flow of blood down the **veins** and result in lower leg swelling, **skin changes** and even skin breakdown (**ulcers**). By removing these non-working **veins**, the symptoms are made better. One can remove these **veins** from the body by pulling them out (**stripping**) or by burning the inside so that they scar shut (**laser** or **radiowave ablation**, or **sclerotherapy**). Other **varicose veins** are usually removed at the same time in similar ways. The patient must know that there can be problems with each method of removal and must believe that the benefits are better than the risks involved.

Commonly asked questions

I have varicose veins. Do I need these to be treated?

Varicose veins are common and many individuals do not experience pain or discomfort with them. While cosmetically unsightly, no treatment is necessary if no other symptoms are present. **Varicose veins** can develop **blood clots** that produce pain, redness and tenderness to the touch and these symptoms can last two to four weeks. This is called ‘**superficial thrombophlebitis**.’ It is not a major problem in most cases and will get better with minor or no specific care. Other symptoms seen with **varicose veins** are pain with standing, itching, skin irritation, leg swelling and other less common symptoms. Such symptoms can lead to the decision to treat. Otherwise, the decision to treat **varicose veins** with out symptoms is best addressed between the patient and the physician on an individual basis.

Are stockings necessary to wear for CVI or varicose veins?

CVI is responsible for a reverse direction of flow that allows blood pooling within the **veins** of the leg at the level of the ankle. An analogy would be a waterfall with the top of the falls being at the level of the groin and the bottom of the pool near the ankle. The larger the waterfall (more significant **reflux**) creates a greater amount of pooling at the ankle. With mild to moderate symptoms, **compression stocking** therapy is extremely effective at controlling leg swelling. While it does nothing to treat the cause of the disorder, stockings can control the symptoms quite well. Stockings are only as good as how faithful the people are about wearing them. The decision to use a “below the knee” stocking versus a “thigh high” stocking is at the discretion of the physician and patient given the extent of the **venous insufficiency** involved.

Which is better, vein stripping or “laser” surgery?

This decision is best made with your doctor once after a careful history of **vein** problems and an examination has been completely. The doctor will also have a **venous Doppler ultrasound** study of all the **veins** in your leg to allow for a better impression of your

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special **venous disorder**. If additional incisions are needed for removal of large numbers of **varicose veins** or the **saphenous vein** is extremely large, **vein stripping** may be in order. Otherwise the less invasive **vein ablative treatments** may well be possible and give an equally good outcome.

Are varicose veins hereditary?

Varicose veins do run in families. The appearance of **varicose veins** also increases with the number of pregnancies a woman may have during child bearing years.

Figure 1: An artist's depiction of lower leg varicose veins in the calf demonstrating the ropy like characteristics of varicosities beneath skin.

