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## ETIOLOGICAL FACTORS CAUSING VARICOSE VEINS AND ITS ADVANCED STRATGICAL TREATMENT FOR CURING VARICOSE VEINS

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### Abstract

The purpose of this study was to evaluate the varicose vein treatment options available today. Numerous techniques exist for managing varicose veins. Treatment for varicose veins yields varying results. Compared to endovenous laser ablation and surgical stripping, foam sclerotherapy and radiofrequency ablation were linked to reduced discomfort and quicker recovery times. When compared to patients undergoing conventional high ligation and stripping, patients receiving endovenous laser ablation and radiofrequency ablation are likely to heal more quickly and return to work sooner. It is necessary to conduct a randomised controlled trial across several sites to determine which method is most effective for treating varicose veins.

**Keywords:** varicose vein, laser ablation and surgical stripping, sclerotherapy and radiofrequency.

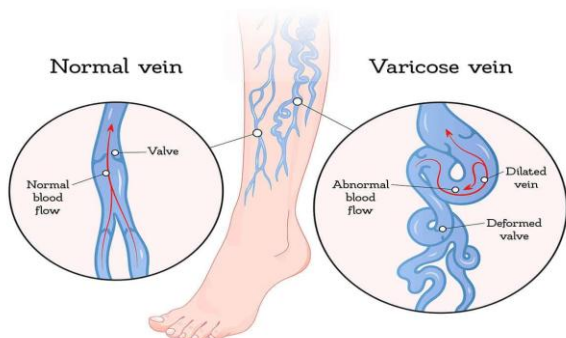
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### Introduction

#### Varicose Veins

Venous illness includes varicose veins. Large, twisted, and painful veins are known as varicose veins. Though it most frequently affects the legs, it can occur anywhere in the body. Because varicose veins are caused by malfunctioning vein valves or weak vein walls, they are indicative of a potential blood clot or disease developing



inside blood vessels [1-4]. Varicose veins affects women roughly twice as frequently as they do men. Because female hormones relax veins, females are more likely than males to be affected [5].

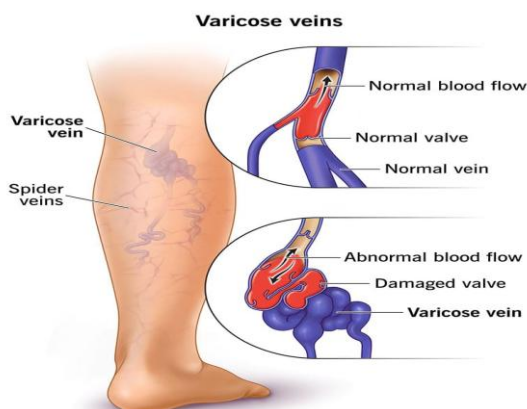
Subcutaneously, this condition is characterised by convoluted, dilated veins that are bigger than or equal to three millimetres. These veins can be non-saphenous superficial leg veins with age or family history, or they can involve the saphenous veins and their tributaries. Although they are not thought to be a major medical condition, varicose veins can cause iscomfort, pain, or itching and may be a sign of more serious health issue [6-10].



### Etiology

It is believed that a combination of genetic and environmental factors causes varicose veins. It could happen anytime your veins' blood pressure rises. Age,

pregnancy, being overweight or obese, spending a lot of time standing or sitting still, and leading a sedentary lifestyle can also cause this. According to recent reports, vitamin shortages may potentially increase the chance of getting varicose veins. Generally speaking, factors that raises your chance of getting varicose veins. Your veins may begin to suffer if these vitamins are low, which increases your risk of developing venous problems like varicose veins. [11-12].



### Epidemiology

In the Framingham Study, the epidemiology of varicose veins was investigated in 3,822 adults. Results show that there is no discernible age difference in the incidence of varicose veins, with women more likely than men to have them. Women with varicose veins were more likely to be obese ( $p < .01$ ), have lower levels of physical activity ( $p < .001$ ), higher systolic blood pressure ( $p < .001$ ), and be older at menopause ( $p < .001$ ) than women without varicose veins [11, 13].

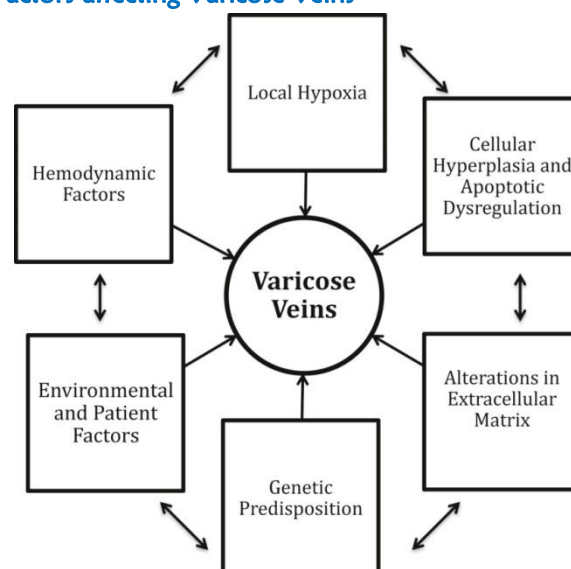
In addition, women who reported engaging in sedentary behaviours (sitting or standing) for eight hours or more on average per day had a substantially higher incidence of varicose veins than women who reported engaging in these activities for four hours or less on average ( $p < .05$ ). Varicose veins were associated with higher smoking rates ( $p < .05$ ) and lower levels of physical activity in men [14]. Only the increased risk of coronary heart disease in women was statistically significant ( $p < .05$ ), despite the fact that both men and women with varicose veins had a higher frequency of atherosclerotic cardiovascular disease than those without them.

### Pathophysiology

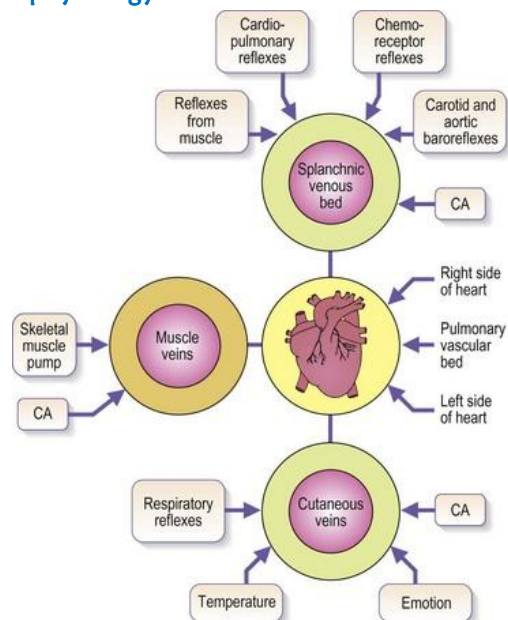
Varicose veins can be caused by a wide range of internal and external factors, such as genetics, age, gender, pregnancy, obesity, height, race, diet, and history of deep vein thrombosis (DVT) [10, 15]. High venous pressure in the extremities and malfunctioning or incompetent valves that cause reflux and consequently high venous pressure in the extremity are the two main diseases associated with varicose veins. It's still unclear if venous hypertension and valvular incompetence emerge

first or later, before the irreversible changes in venous wall development. Numerous pathophysiological mechanisms, including as cellular hyperplasia, hypoxia, and dysregulated apoptosis, may impact and modify the extracellular matrix composition in the affected vein at the cellular level.

### Factors affecting Varicose Veins



### Pathophysiology of Varicose Veins in Flow Chart



### Causes

- Age
- Sex
- Pregnancy
- Overweight Or Obesity[7]
- Individuals With A Long Family Histroy
- Standing Or Sitting For Long Periods Of Time
- Hypertension

- Stress
- Oral Contraceptive
- Wearing High Heels
- Lack Of Exercise
- Wearing Tight Clothes
- Diabetes Mellitus
- Smoking
- Orthopedic Injury
- Being Inactive [8]

### Symptoms:

**Varicose veins might not cause pain. Symptoms of varicose veins include**

1. Veins that match the skin's tone, such as dark purple or blue.
2. These changes may be more or less noticeable depending on the hue of the skin. [8].
3. Bunions that appear to be twisted. They frequently resemble cables on the legs.

**When there are painful symptoms of varicose veins, they might include**

1. A sensation of weight or ache in the legs.
2. Lower leg pain, oedema, burning, and throbbing in the muscles.
3. Severe pain during extended periods of sitting or standing.
4. Scratching around one or more veins.
5. Skin tone shift surrounding varicose veins [7].

### Diagnosis of Varicose Veins:

#### Medical History

Numerous variables may influence your likelihood of developing varicose veins. Hormones, inactivity, and weight gain, for instance, can all raise your risk of developing varicose veins.[15]. If you have venous insufficiency, it could also be influenced by your family history. A specialist can have a better understanding of your venous issues and any other health issues that can influence treatment by reviewing your medical history.

#### Physical Examination

During a physical examination, veins from the thigh to the ankle may appear noticeably enlarged. Usually, the discolouration is more noticeable in the area surrounding the ankle and leg. [10].

- Leg Heaviness.
- Itching.
- Cramps.
- Mild Tenderness.
- Skin Discolouration.
- Exercise Intolerance.
- Leg Fatigue.

#### Laboratory Tests

Your physician at NYU Langone does a physical examination and enquires about your medical history. He or she examines the veins' colour, texture, and state. Check to see if your veins are varicose. To determine the size of the veins, the direction of blood flow, and to check for blood clots, the doctor may also prescribe an imaging test.

Varicose veins can be treated with a variety of diagnostic procedures. Being aware of them beforehand facilitates timely and accurate diagnosis and treatment.

The following are the different diagnostic tests:

**Duplex ultrasound:** The most popular diagnostic test is the duplex ultrasound exam. This non-invasive diagnostic creates pictures of the blood flow and vein valves using sound waves. This test involves applying a gel to the skin to be evaluated and moving a transducer, a hand-held device, over the area. [3]. Using sound waves, the transducer creates 2D images of the veins in the legs that can be viewed on a computer screen. The duplex ultrasonography test aids in the detection of any vein-related blood clots. Blood thinners may be recommended if the doctor finds any blood clots in order to break them up. After the test, which lasts between thirty and sixty minutes, you can resume your regular activities right away.

**Trendelenburg Test:** It is sometimes referred to as the Brodie-Trendelenburg exam. This test is performed to assess a patient's varicose veins for valve incompetence. The patient must lie down with the afflicted limb raised or elevated throughout the test. Gravity and the doctor's leg squeezing will aid to drain the vein. After that, the superficial vein in your upper thigh is blocked with a tourniquet, and you'll be instructed to get up. The saphenous vein's fullness will now be examined [8:14 p.m., August 15, 2024]. Normally, filling the veins takes thirty to thirty-five seconds. If the superficial vein fills up more quickly after applying the tourniquet, this could be a sign of poor superficial vein function and valvular incompetence in the veins. Should the filling not proceed quickly, the tourniquet will be removed. To identify the areas where the valves are incompetent, the test can be repeated with a tourniquet positioned at various levels. Additionally, this test detects if there is retrograde blood flow at the saphenofemoral junction [3].

**Schwartz Test:** The purpose of this test is to validate the varicose vein diagnosis. A single-handed tap will be performed on the lower leg, the site of a lengthy saphenous varicose vein, during the examination. The superficial venous system's valves are not functioning if an impulse is felt at the saphenous opening.

**Perthe's Test:** This test is used to distinguish between superficial and deep vein valvular insufficiency. You must apply a tourniquet on your mid-thigh while standing in order to complete the test [3]. After that, you have five minutes to walk. Reduction in the expansion of varicose veins suggests a problem with the superficial venous

system, but no issue with the deep venous system. An issue with the deep venous system is indicated if the varicose veins continue to expand. Prior to undergoing surgery to remove the superficial veins, this test is carried out.

### Treatment Goals



Your healthcare professional may suggest a combination of treatments and preventive actions, contingent on the severity of your symptoms. Remember that you might need multiple treatments or that new varicose veins could develop even after therapy [8].

Relieving discomfort, preventing varicose veins from getting worse, improving looks, and avoiding major side effects including bleeding and ulceration are the objectives of treatment. A few lifestyle modifications that can help with varicose veins may also reduce your risk of deep vein thrombosis and other health issues.

Your doctor could advise compression therapy and pain medication if you are expecting in order to treat varicose vein symptoms including leg pain or heaviness.

### First Line Treatment

For varicose veins, graduated compression stockings are frequently utilised as the initial line of treatment. In order to maintain the superficial veins deflated and blood-free, compression stockings compress them, which forces more blood into the deep venous system [7]. Leg swelling consequently decreases as a result of the leg's venous pressure being lowered. Gradient compression increases blood velocity in the deep vein system by applying an external pressure at the ankle that is higher (minimum 14 mmHg) than it is at the calf and thigh. It is acknowledged that the severity of the ailment determines how much pressure is needed.

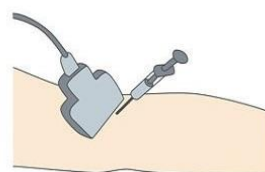


Graduated compression stockings come in a wide variety of brands and styles, both prescription and retail. These consist of various lengths (such as thigh or knee length) and compression strengths. It can be confusing to compare the compression hosiery strength classification systems used by the British and European authorities. Class III may be more efficient, but as they are more challenging to put on, care should be taken into account regarding the person's physical dexterity. European standard class II graduated compression hosiery is most commonly given for venous hypertension symptoms. Since wearing the hosiery is necessary for the treatment to be effective, adherence to the prescribed regimen is crucial.

In addition to compression therapy, general health recommendations for physical activity and weight loss have been made in an effort to lessen the intensity of symptoms and stop varicose veins from getting worse. It has also been proposed that sitting with the legs elevated above the level of the heart can help reduce symptoms.

### Injection Sclerotherapy

Sclerotherapy vein treatment



Ultrasound is used to precisely locate the affected vein



The sclerosant drug is injected into the varicose vein, causing the vein to collapse

uses chemical irritants to destroy undesirable veins in the skin. Sclerotherapy is mostly used for nonaxial varicose veins that are smaller than 6 mm in diameter. Sclerotherapy may be recommended for symptomatic or even asymptomatic varicose veins for aesthetic reasons. The treatment of varicose veins now includes a number of sclerosing agents. In order to treat reticular and spider veins that have a diameter of one to three millimetres or less, polidocanol is frequently utilised. Higher concentrations (0.5 % versus 1 %) are used to treat spider veins, and the injections should be repeated in one to two weeks [10].

The most common and recommended method of treating varicose veins caused by chronic venous insufficiency lately is the application of cyanoacrylate glue. This method offers a number of benefits, such as being a minimally invasive process that takes little time and doesn't require the induction of anaesthesia.

#### **Conservative Treatments**

Long-term graduated compression stockings, leg elevation, and oral painkillers are effective in providing most patients with sufficient symptom relief. In compression rates, a graduation of 20–30 mmHg is advised, with the possibility of raising it to 30–40 mmHg in more extreme circumstances [10]. If a patient is not interested in surgery, wearing stockings on a daily basis is the best course of action. Although the effects are real, compliance may suffer in warmer temperatures.

#### **Surgical Treatment**

The more common surgical procedure involved ligating and severing the larger saphenous vein together with its tributary veins.

Surgical procedures include vein ligation and/or excision; however, the choice of approach depends on the location, size, and degree of venous involvement, whether or not venous reflux is present. When there is involvement of both limbs, unilateral surgery is advised to reduce the possibility of intolerance and post-operative difficulties.

When removing saphenous veins, complete skin exposure and strict hygienic measures are adhered to. The lower extremities, from the anterior superior iliac spine to the ankle, are prepped and wrapped circumferentially. Alcohol-containing skin preparation is discouraged because many skin marks are required. The final stage should be skin preparation for the skin that covers the ulcer if there is venous ulceration. Using curtains, the ulcers should be kept out of the sterile operative zone. Tourniquet application has been advised due to the possibility of severe blood loss during the procedure, particularly in the large convoluted veins.

When a tourniquet was applied, the blood loss was as little as 16 ml, as opposed to about 133 ml when it wasn't. Furthermore, no reports of long-term consequences, such as nerve damage, were made. On the other hand, poor tourniquet application may result in deep vein thrombosis from prolonged stasis or further bleeding issues from venous hypertension [10].

**Removal and inversion of saphenous veins** A transverse incision is performed up to 2 centimetres over the saphenofemoral junction, which is 3 centimetres peripheral to the pubic tubercle and ideally marked with a Duplex scan. The location and isolation of the saphenofemoral junction are made. The abdominal wall branches are left intact; only the anteromedial and posterolateral tributaries are ligated. To reduce the likelihood of varicose vein recurrence, the latter is

advised. The confluence of the common femoral vein (CFV) and the greater saphenous vein (GSV) is where the GSV's greater end gets ligated. As a result, a caudal retrograde vein stripper is passed. It is anticipated that the inadequate venous valve will pass without incident. [10]. The vein stripper's proximal end is fastened in the groin, and the distal end is pulled out next to the patella. It is not recommended to use mushroom tips since they can cause severe bleeding and tissue damage. Consequently, venous marsupialization and removal would occur. The tributary veins are severed, perfect haemostasis using direct pressure, and multilayer closure of the groin incision mark the completion of the treatment. The tiny saphenous varicose vein is also advised for inversion and excision. Nonetheless, one should take into account the possibility of neurovascular bundle problems following popliteal fossa dissection and sural nerve damage.

**Elevated saphenous ligation** Even though the saphenofemoral junction is where the saphenous vein is ligated, this procedure is not as recommended because of the increased recurrence rate, enduring symptoms, and incidence of distant superficial thrombophlebitis. Patients with proximal superficial phlebitis that creeps on the saphenofemoral junction and is contraindicated for anticoagulation should consider high ligation of the saphenous vein.

#### **Ambulatory Phlebectomy**

Multiple skip incisions are made throughout the treatment to remove and avulse the affected superficial vein. There are several ways to treat varicose veins, one of which is to combine the process with saphenous inversion. An 18 gauge needle or an 11-bladed scalpel are used for punctures. The target vein is punctured next to it. Venous segments in succession are ligated and avulsed. Limb elevation combined with direct pressure application controls post-procedural haemorrhage.

#### **Transilluminated Powered Phlebectomy**

Comparing the approach to other minimally invasive venous ablation techniques, its application is less widespread. Under general or regional anaesthesia, the technique is carried out in three distinct steps using a saline, lidocaine, and epinephrine mixture. Hydrodissection of the affected veins is the first step in the surgery. Then, the lighting device is inserted, and the veins are macerated and aspirated through the second incision. The technique is based on using a transilluminated powered phlebectomy (TIPP) labelled mechanical aspirator. Phlebectomy using lighted power is regarded as a minimally invasive technique requiring fewer incisions. But a more costly operation will inevitably result in a haematoma and a far greater range of post-operative pain.

#### **Endovascular Management**

For EVTL, catheter-based endovenous ablations using laser or radiofrequency have been widely utilised. It is

best to perform the surgery under local anaesthetic. Oral anxiolytics, however, may be added for patients who are anxious. A few centimetres away from the saphenofemoral or saphenopopliteal junction, a catheter is inserted antegradely. The entire saphenous vein catheter path is totally sedated. After that, during the catheter withdrawal, the saphenous vein would be destroyed using either heat energy or radiofrequency [10].

### Prognosis

Varicose veins cannot be cured. Recurrences tend to occur even after surgical removal. Venous ulcer patients have the highest morbidity rates and the lowest quality of life [10]. Because clots in superficial veins seldom embolise, unlike those in the deep venous system, there is little chance of a pulmonary embolism. The majority of people seek treatment for varicose veins primarily because they are unsightly and should be corrected.

### Complication

- Venous ulcers
- Pain
- Poor cosmesis
- According to a Taiwanese database study on deep vein thrombosis (DVT) and pulmonary embolism (PE), the propensity for DVT in patients with varicose veins was (6.6 versus 1.2 per 1000 person-years; hazard ratio, 5.30) and (0.48 versus 0.28 per 1000 person-years; hazard ratio, 1.73). However, additional corroborating research is required to validate this proposed correlation and ensure that it remains unaffected by confounding factors such as obesity and smoking.
- Pain and continued bleeding could complicate superficial thrombophlebitis.
- Superficial vein thrombosis.

### Postoperative and Rehabilitation Care

- The administration of compression dressings after surgery is a crucial part of therapy for patients after varicose vein surgery. Even with the importance of compression therapy in the treatment of varicose veins, the advice is unclear. Consequently, pressures of 40 and less than 20 mmHg in the peri-malleolar region below the knee are advised in the treatment of venous ulcers [10].
- It is common practice to prescribe compression stockings following surgical or laser ablation procedures for varicose vein disease; however, opinions on the necessity and ideal length of time for compression therapy are divided.
- After endo-venous laser ablation (EVLA) with a dual-ring radial fibre laser operating at 1470 nm in diode, the ideal length of compression therapy was assessed. The authors came to the conclusion that the

results would not be much altered by long-term compression stocking for more than two days after EVLA. The outcomes went against the conventional advice to use compression therapy for at least one week. It should be noted, though, that the aforementioned prospective research examined the lower, less useful wavelength of 810 nm.

- Deterrence and Patient Education
- Graduated compression hose
- Healthy weight
- Exercise

### Pearls and Other Issues

Due to the symptoms of leg pain and swelling, venous reflux disease is a frequent disorder that significantly affects lifestyle and has the potential to cause more serious morbidity by eventually forming venous ulcers [10]. Typically, compression therapy is used in conjunction with endovenous ablation treatment to minimise related symptoms.

### Conclusion

Dilated veins, or varicose veins, can produce pain, oedema, itching, and skin abnormalities. If a procedure is planned, the diagnosis is made during a physical examination and is then confirmed by a vascular ultrasound test. Elastic compression stockings are part of the medical treatment for varicose veins; they can reduce symptoms but cannot completely eliminate them. Sclerotherapy, ambulatory phlebectomy, and endovenous laser ablation are minimally invasive therapeutic alternatives for patients who still have symptoms. Your veins' size, shape, and type will determine the course of treatment. Complications from treatment are rare.

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