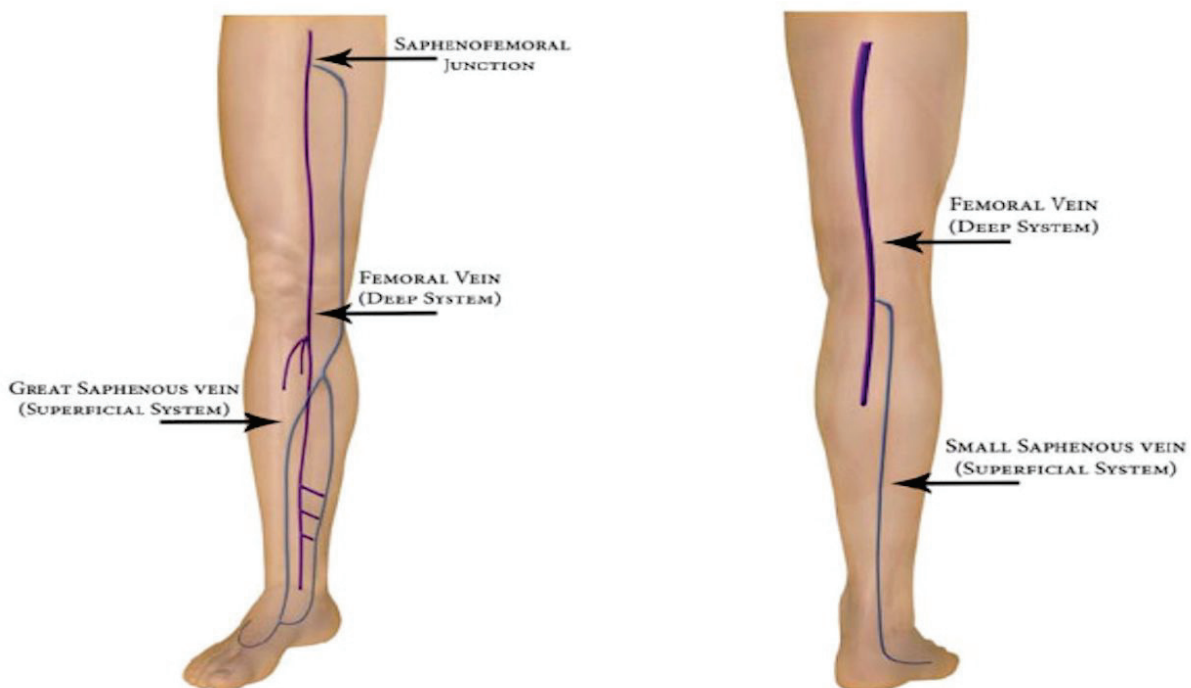


# Treatment of Lower Extremity Varicose and Spider Veins

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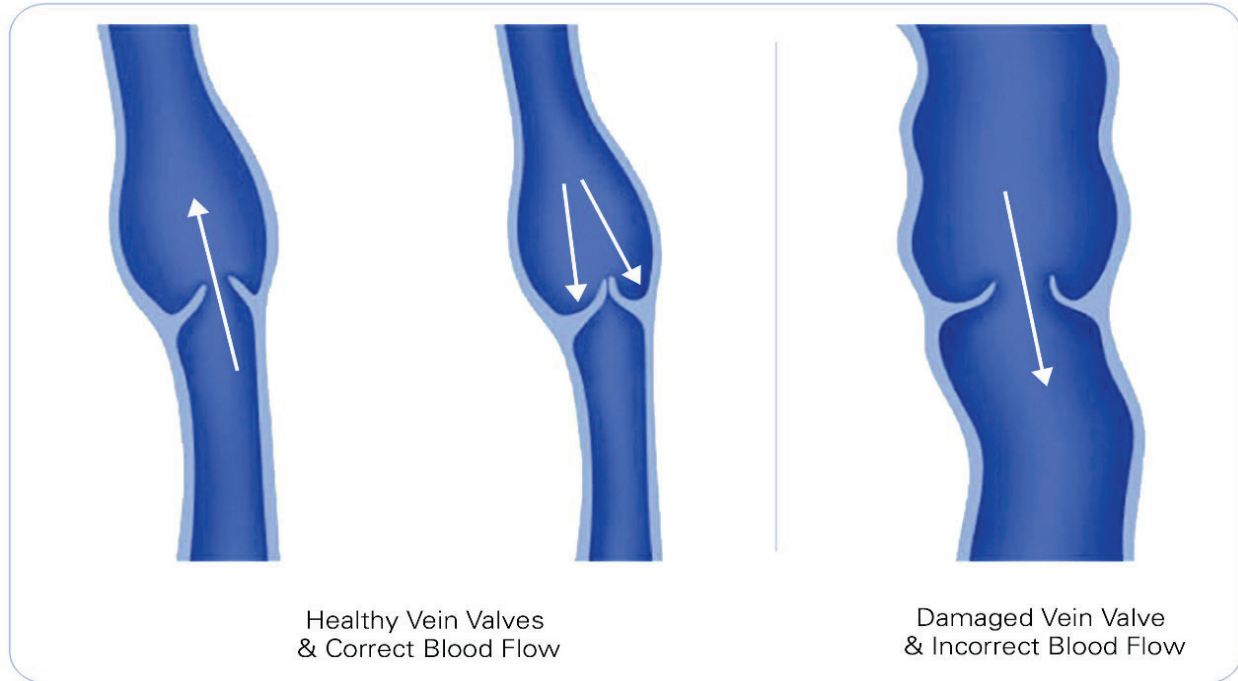
**Background and Introduction:** Varicose veins are often the result of an underlying disorder of the circulatory system called venous reflux or insufficiency. Veins are an integral part of the circulatory system as are the heart and the arteries. Approximately 25 million suffer from symptomatic varicose veins in America. It is estimated that in America, 72% of women and 42% of men will experience varicose veins by the time they are in their 60s. Venous reflux disease is twice more prevalent than coronary heart disease (CHD) and five times more prevalent than peripheral arterial disease (PAD). Mainstay of treatment of lower extremity varicose veins is directed toward treatment of the greater saphenous vein (GSV) and the short saphenous vein (SSV) as well as their tributaries.



Patients with lower extremity vein disease can have a variety of symptoms, some of which may not be typical of varicose veins. Additionally, these symptoms may be present even if patients have no visual evidence of varicose veins. Some typical findings associated with varicose veins may include swelling in legs, discoloration around the ankles, or leg ulcers. Other not so typical symptoms include heavy, tired, restless or achy feelings in legs. Some may have fatigue and tightness in calves. Others may have sensations of burning or itching.



Superficial venous reflux disease is the leading cause of varicose veins and is caused by incompetent or "leaky" valves in vein running from foot to inguinal region. This condition can be progressive and symptoms may worsen with time. Left untreated, it can lead to chronic and debilitating conditions. Worsening symptoms frequently force patients to dramatically change their lifestyles, especially when they have standing professions and can no longer tolerate being on their feet all day. Normal veins have one-way valves which channel and direct the blood back to the heart and prevent backflow or reflux of blood. When the valves are working properly, blood flows up towards the heart. When the valves leak, gravity causes blood to return back to the lower legs and feet. These leaky or insufficient valves are the underlying mechanism of varicose vein disease. The reversal of blood flow forces veins to progressively enlarge to form varicosities. During long periods of standing or sitting, the blood in leg veins can pool to increase the pressure within the veins. Over time, vein walls weaken and dilate. This unhealthy circulatory pattern may lead to lower extremity tissue damage, swelling, dermatitis, and ulceration. As the blood is not flowing, the varicosities may clot and cause phlebitis, or they may rupture and bleed. Obstruction or increased pressure in the path of blood flow causes vein walls to stretch and cause the inability of valves to close properly. Therefore, leg veins close to the skin surface enlarge and result in what is commonly called varicose veins.



In normal veins, blood is propelled by calf muscle pump cephalad toward the heart. Blood moves only in one direction to open the valve and gravity causes closure of the valve to avoid reflux of blood back down to the lower legs and feet. In incompetent (varicose) veins, valves allow retrograde flow of blood, known as venous reflux or venous insufficiency. The valve edges do not completely oppose each other and lead to blood leaking in the wrong direction.

**Varicose Vein Treatment and its Complications:** These are varying forms of vein disease namely: varicose veins, reticular veins, and spider veins. Spider veins are dilated small blood vessels visible as blue or red streaks, webs, or clumps located within the superficial skin. They are different than varicose veins which occur as lumps/ropes underneath the skin within the fatty layer. Spider veins are permanent once they appear and tend to increase in number over time. Spider veins drain into collecting veins at the base of the skin called reticular veins which are larger and usually of a greenish or bluish hue. Reticular veins may or may not be visible to the naked eye. Identification and treatment of the reticular veins is an important part of success in controlling spider veins.

Traditionally, patients diagnosed with venous reflux disease would undergo vein stripping surgery which resulted in relatively long return to work recovery time. Now patients can be treated with the endovenous ablation procedures or sclerotherapy, both of which are minimally invasive alternatives to painful vein stripping operations. Sclerotherapy is a medical procedure used to treat varicose veins, reticular veins and spider veins. A tiny needle is used to inject a solution directly into the vein. The solution irritates the lining of the vessel, causing it to swell and stick together, and the blood to clot. Overtime, the body will absorb the treated vein.

**Patient A**



**Before**

**After**

**Patient B**



**Before**

**After**

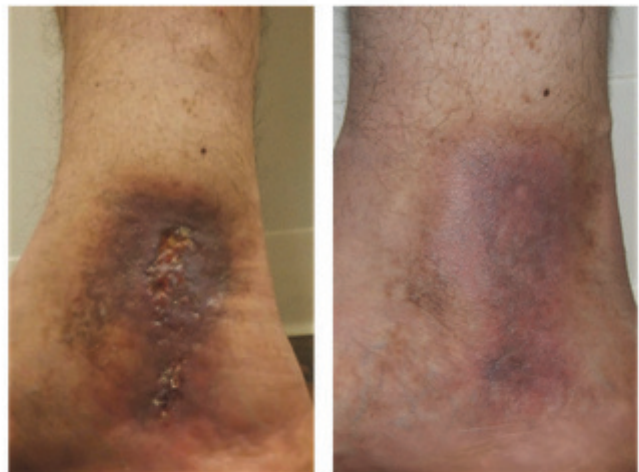
**Patient C**



**Before**

**After**

**Patient D**



**Before**

**After**



I have had effective and successful treatment of spider veins and telangiectasias with sclerotherapy as well as Quanta MDK III Nd:YAG 1064 Long Pulse Laser. In many aspects, the Nd:YAG 1064 LP is much more effective and superior as I can treat much smaller diameter veins which cannot be accessed with a 31 gauge sclerotherapy needle (Figures 1-5).

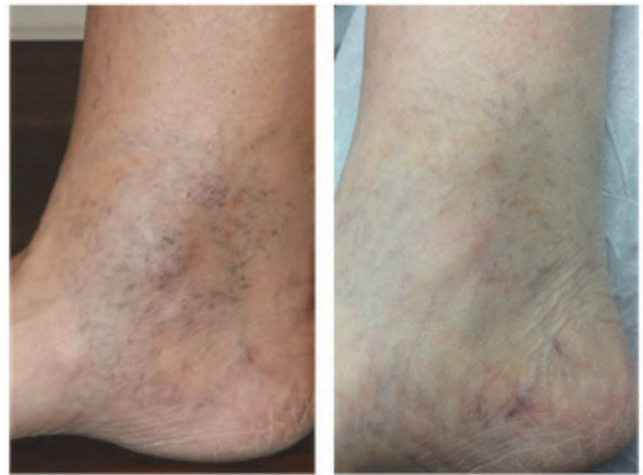
**Figure 1**



**Before**

**After**

**Figure 2**



**Before**

**After**

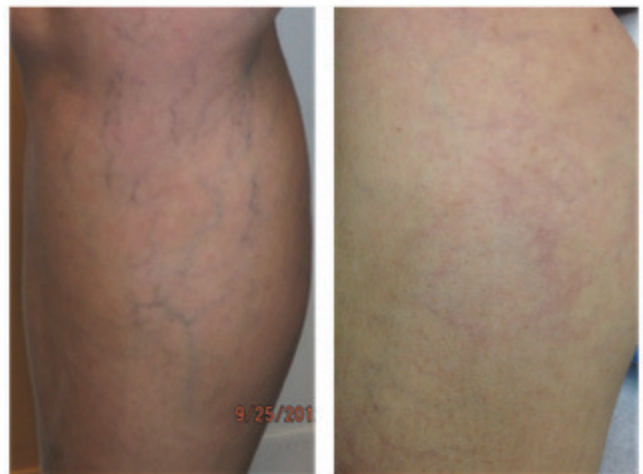
**Figure 3**



**Before**

**After**

**Figure 4**



**Before**

**After**

**Figure 5**



The Quanta MDK III Nd:YAG 1064 Long Pulse Laser wavelength is uniquely positioned to treat leg veins, spider veins and telangiectasias. The long pulsed 1064 nm Nd:YAG laser is the primary laser to use for most leg spider veins. The endpoint is immediate disappearance of the veins with subsequent blanching of the skin over the vessel. If there is no response vein disappearance, incremental increase of fluency or decrease in pulse duration should yield satisfactory results. There should be no graying of the surface of the skin and again, the endpoint is still blanching of the skin.

### Treatment Parameters

Wavelength / Mode	Spot Size	Rep. Rate	Recommended Fluence	Pulse Width	Skin Cooling
1064nm LP	3mm, round	2 Hz	180-220 J/cm <sup>2</sup>	10-15 ms	Contact Cooling +4°C (no sapphire window)

**Treatment notes:** The above settings are recommended for the first treatment. Always adjust parameters based on patient response to treatment. Minimum 6 weeks suggested in between treatment.

With the advent of new technology, the larger varicose veins can be treated using minimally invasive heat induced endoluminal ablation. This is a very effective treatment however, potential

known complication include brown matting and hemosiderin deposition of the overlying skin as will be discussed below.

### **Laser Treatment of Lipodermatosclerosis and Venous Stasis Skin Changes:**

Lipodermatosclerosis refers to a skin change of the lower legs that often occurs in patients who have venous insufficiency, venous incompetence and obesity. It has been proposed that there is an acute inflammatory stage of lipodermatosclerosis, which is followed in several months or perhaps even years by a chronic stage. It is a type of inflammation of skin and subcutaneous tissue/fat characterized by extensive fibrosis or sclerosis (scarring) in the skin and subcutaneous tissue. Venous hypertension can cause diffusion of proteins and fibrin out of capillaries which may predispose the tissue to ulceration. Back pressure in the capillaries results in the activation of cells and soluble factors which encourage inflammation. Recurrent ulceration and healing as well as fat necrosis are associated with lipodermatosclerosis.

In advanced lipodermatosclerosis, the proximal leg swells from chronic venous obstruction and the lower leg shrinks from chronic ulceration and fat necrosis resulting in the inverted coke bottle appearance of the lower leg. The origin of lipodermatosclerosis is probably multifactorial, involving tissue hypoxia, leakage of proteins into the interstitium, and leukocyte activation. Studies of patients with lipodermatosclerosis have demonstrated significantly decreased concentrations of cutaneous oxygen associated with decreased capillary density. Capillaries are virtually absent in areas of fibrotic scars, leading to a condition known as atrophie blanche or livedoid vasculopathy.

In selected patients, Quanta MDK III Nd:YAG 1064 Q-Switch Laser can be used in the treatment of lipodermatosclerosis. The frequency and number of required treatments are based on the patient's disease severity and physical findings (Figures 6 and 7).

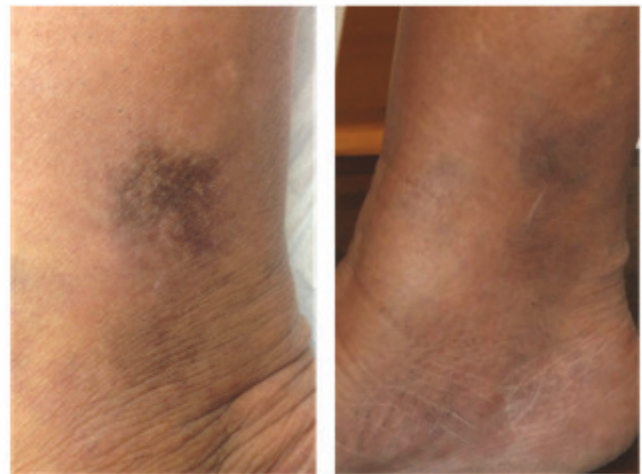
**Figure 6**



**Before**

**After**

**Figure 7**



**Before**

**After**

**Laser Treatment of Hemosiderin Deposition After Varicose Vein Treatment:**

Iron is primarily found in red blood cells attached to and carried by the Hemoglobin molecule. Release of blood into surrounding tissues can occur from vein treatment (endovenous ablation and sclerotherapy), trauma, stasis dermatitis or bruise. A protein called Ferritin binds the free Iron within tissues. The Ferritin is phagocytized in the skin by macrophages and stored as a complex structure called Hemosiderin. Hemosiderin is an Iron-storage complex of Ferritin, denatured Ferritin and other material. The Iron within deposits of Hemosiderin is very poorly available to supply iron when needed.

Hemosiderin deposition over the areas of varicose vein treatment can be seen as yellow-brown pigmentation of the skin in multiple pictures shown below (Figures 8-22). Subsequent treatment of the areas of Hemosiderin deposition with Quanta MDK III Nd:YAG 1064 Q-Switch Laser has led to significant improvement of discoloration and return of the underlying skin to its original color and texture.

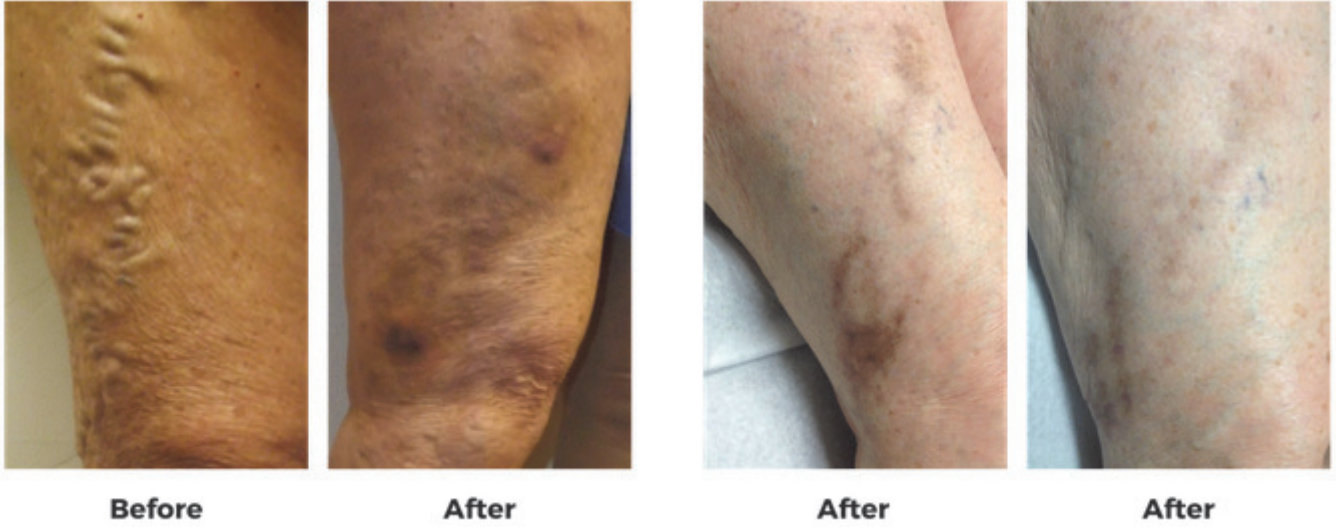
**Suggested Treatment Parameters**

Wavelength / Mode	Spot Size	Rep. Rate	Recommended Fluence	Skin Cooling
1064nm QS	4x4mm	5 Hz	4 J/cm <sup>2</sup>	Zimmer Cryo 6

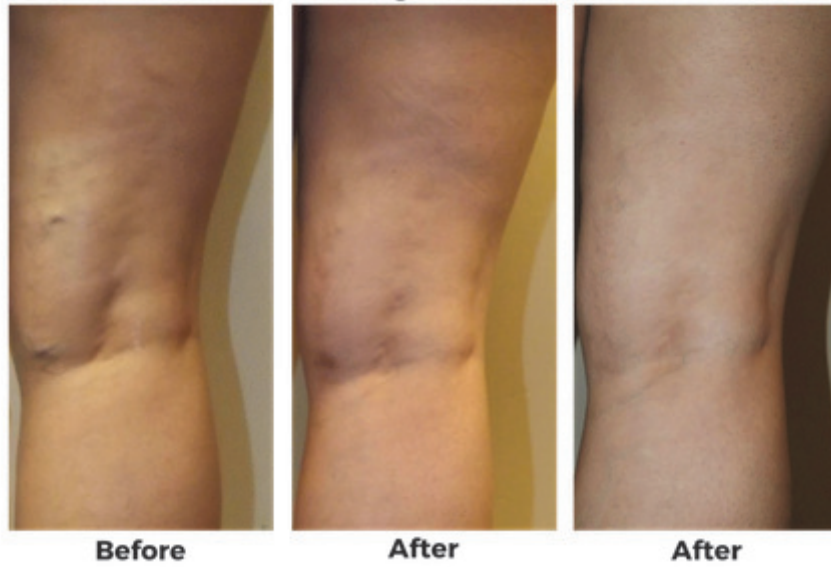
**Treatment notes:** The above settings are recommended for the first treatment. Increase 1 J/cm<sup>2</sup> for each subsequent treatment. Average number of treatments required, 3-4. Minimum 6 weeks suggested in between treatment.



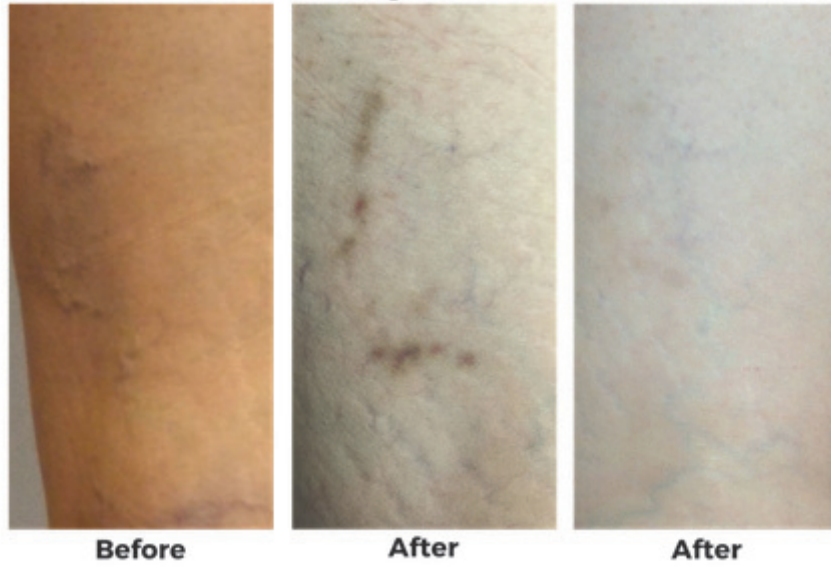
**Figure 8**



**Figure 9**



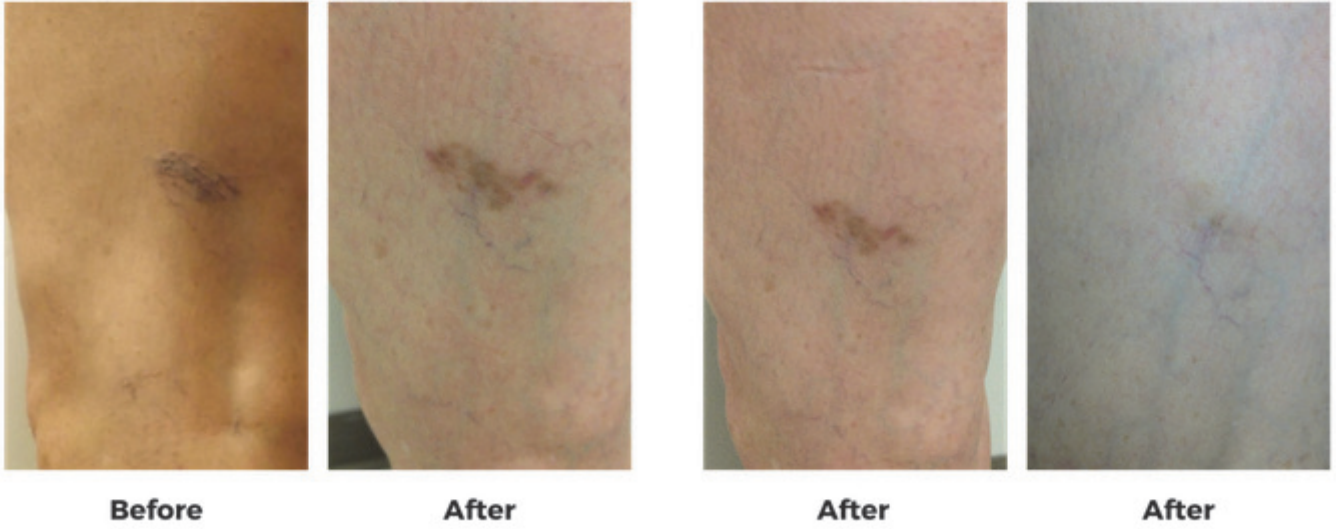
**Figure 10**



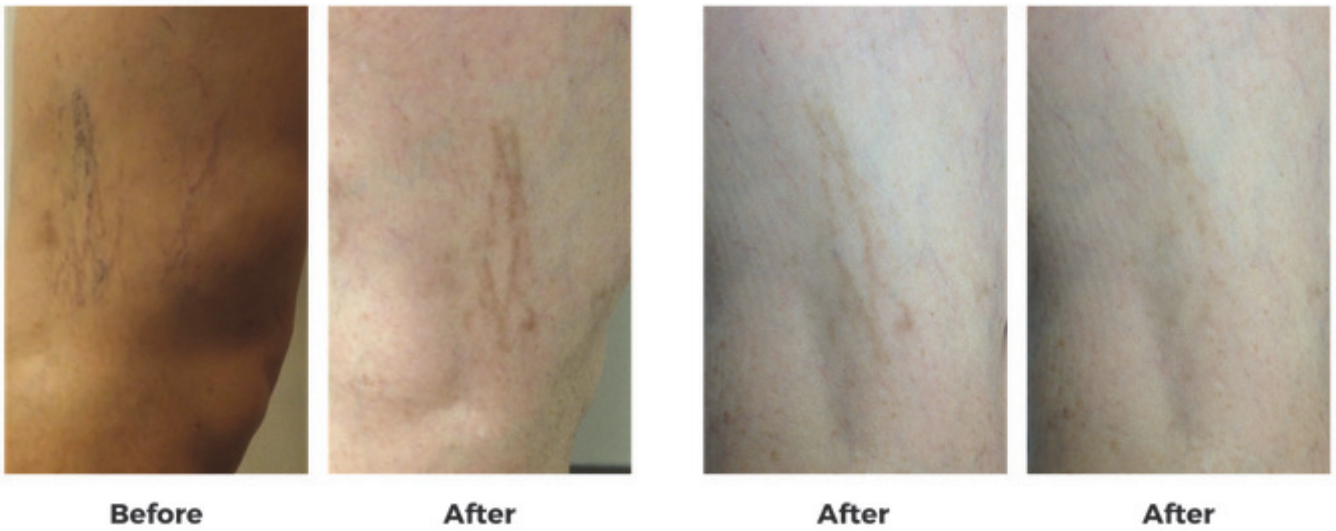
**Figure 11**



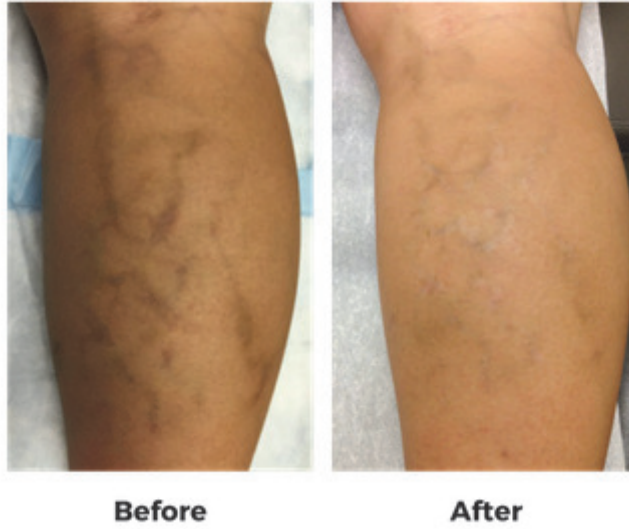
**Figure 12**



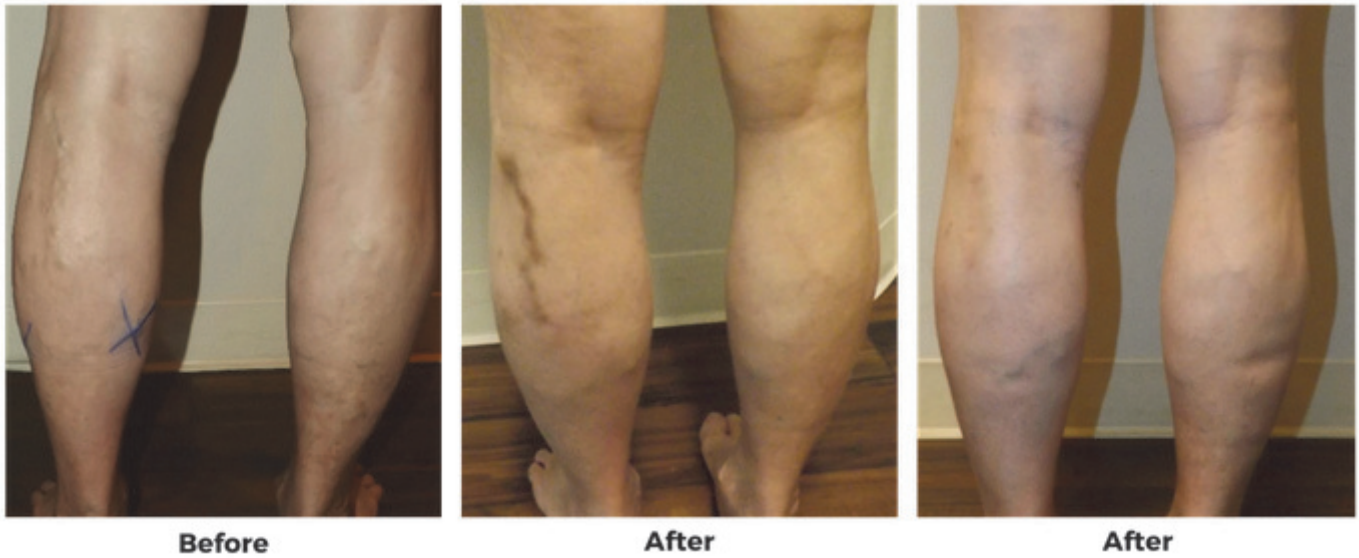
**Figure 13**



**Figure 14**

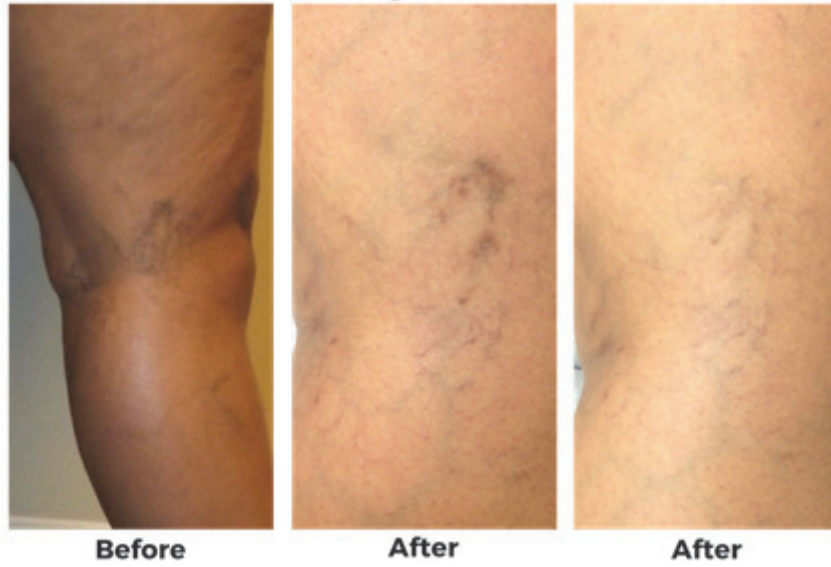


**Figure 15**

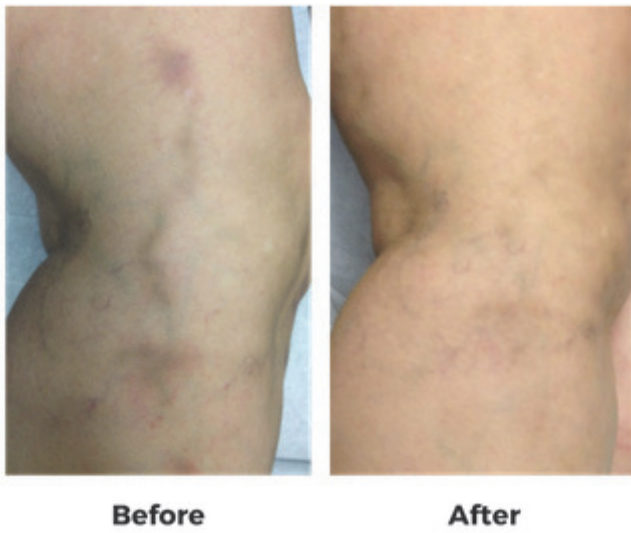




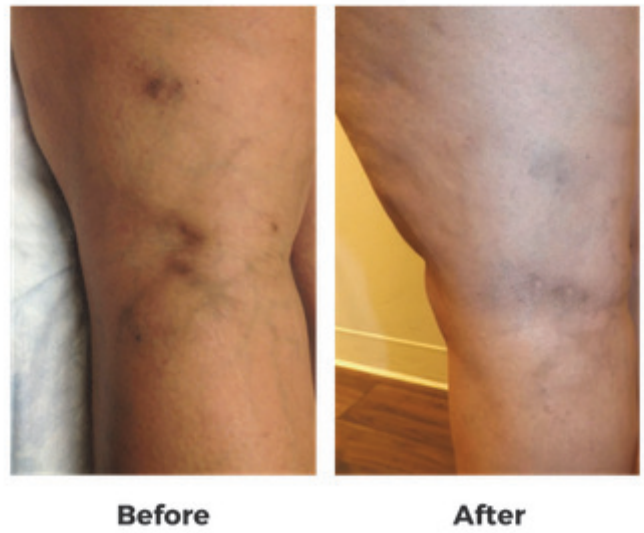
**Figure 16**



**Figure 17**

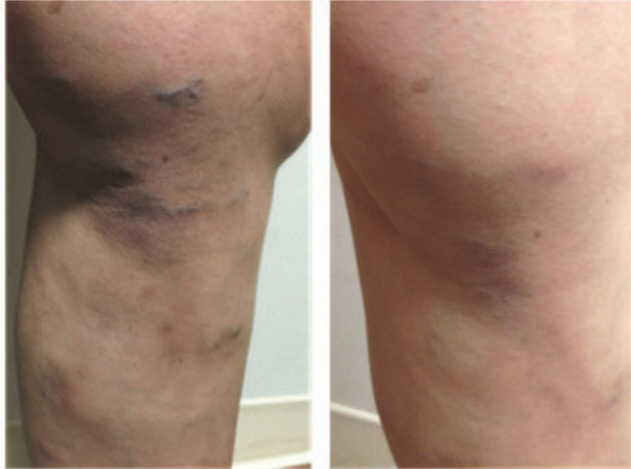


**Figure 18**





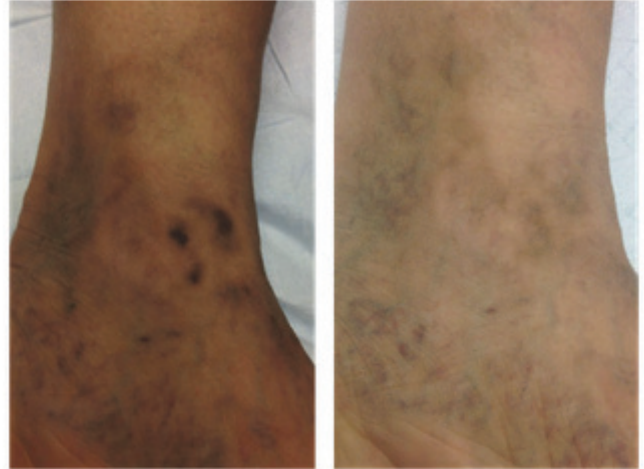
**Figure 19**



**Before**

**After**

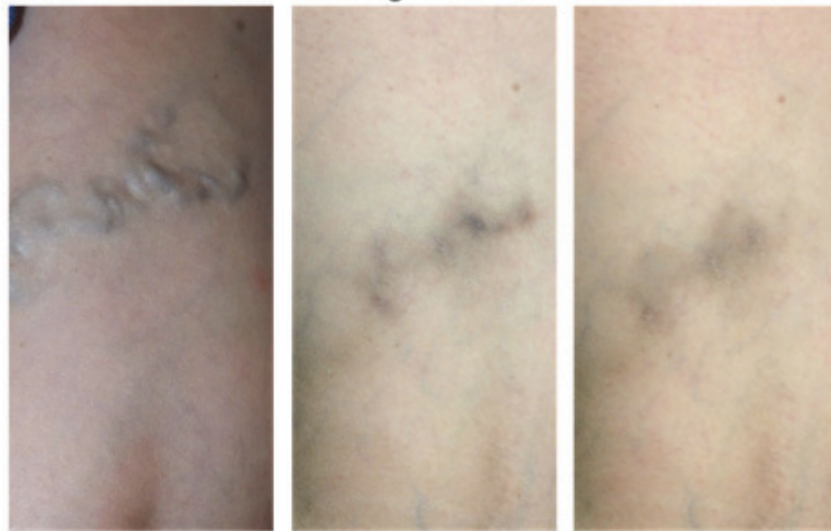
**Figure 20**



**Before**

**After**

**Figure 21**

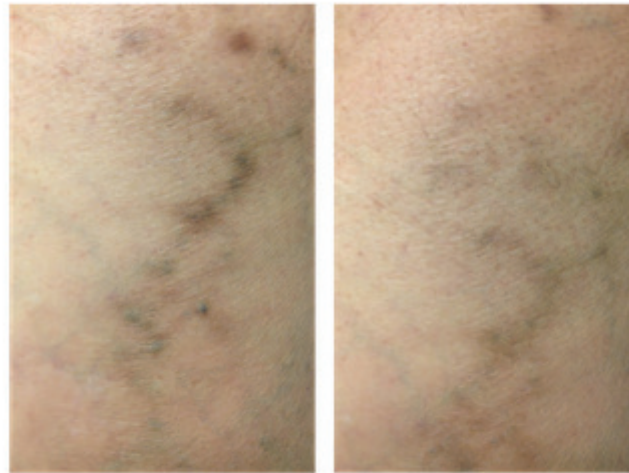


**Before**

**After**

**After**

**Figure 22**



**Before**

**After**

**Conclusion:**

This white paper has demonstrated the practical application of the Quanta MDK III Laser being used when the treatment of lower extremity varicose and spider veins are being performed.