

Digital Vein Mapping Guiding Laser and Injection sclerotherapy to treat telangiectasias and Feeder Veins: Report of 140 Cases.

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Abstract

Background and Objective: Telangiectasias treatment inefficiency may occur due to invisible feeder veins. These veins can be made discernible by use of a digital vein detection device (V-V). This study evaluates a method to treat vascular lesions by combining 1064nm laser, injection sclerotherapy, a skin cooling device (CLaCS) and the V-V.

Materials and Methods: Patients were treated with laser and sclerotherapy, both applied under cooling. V-V was used to visualize hidden feeder veins.

Results: A total of 140 patients underwent CLaCS. In 121 patients (86%) satisfactory cosmetic results were obtained avoiding phlebectomy. Partial or unsatisfactory outcome was observed in 19 patients (14%).

Conclusion: This more comprehensive way to evaluate telangiectasias extends the treatment of lesions by direct vision to those correlated invisible vessels, guided by a digital device.

Keywords: Laser, Sclerotherapy, Telangiectasia, Feeder vein

Resumen

Antecedentes y Objetivo: la ineficiencia en el tratamiento de las telangiectasias puede deberse a las venas nutricias no visibles. Estas venas pueden hacerse perceptibles mediante el uso de un dispositivo digital de detección (VV). Este estudio evalúa un método para el tratamiento de lesiones vasculares mediante la combinación de láser de 1064nm, la escleroterapia por inyección y un dispositivo de enfriamiento de la piel (CLaCS, Cryo-Laser y Cryo-Sclerotherapy)) y el VV (The Vein Viewer™).

Material y Métodos: Los pacientes fueron tratados con láser y la escleroterapia, ambos aplicados bajo enfriamiento con (CLaCS). El dispositivo digital V-V se utiliza para visualizar las venas nutricias ocultas.

Resultados: Un total de 140 pacientes se sometieron a CLaCS. En 121 pacientes (86%) los resultados estéticos obtenidos fueron satisfactorios evitándose una flebectomía. Resultados parciales o insatisfactorios se observaron en 19 pacientes (14%).

Conclusión: este modo de tratamiento, permite tratar las telangiectasias en forma más abarcativa ya que extiende la terapéutica a los vasos invisibles en forma directa, guiado por un dispositivo digital.

Palabras clave: Láser, Escleroterapia, Telangiectasia, venas nutricias

Introduction

The most popular trend in phlebology is foam injection. This technique dates from decades and was reassessed by the turn of this century to a better and modern way.

In spite of that, we are on the opposite lane, heading towards expensive technology.

The objective of this study is to describe and discuss a series of 140 cases bearing varicosities that were treated under visual digital guidance in a completely different way. Sclerosis was achieved by combination of thermal and chemical agents: laser and dextrose.

Methods

Patients

This study was conducted between July 2005 and Jan 2006 in our clinic.

Inclusion criterion of patients was the presence, isolated or combined, of varicose veins, telangiectasias and feeder veins (CEAP 2 or 3).

Exclusion criteria were:

- Reflux (longer than 1 second) in any saphenous vein;
- Other symptomatic pathologic conditions, under treatment or not;
- Previous surgery for varicose veins;
- Impossibility of follow-up (just one session without return);
- Loss of contact.

Patients were organized in groups displayed on a table were each received a score from 9 to 1. This table helped us to organize patients based on two questions (Table 1):

1- on the horizontal lines: which kind of varicose veins does the patient have (with or without reflux on saphenous veins), if any?

2- on the vertical rows: which kind of telangiectasias does the patient have (with or without feeder veins connected), if any?

All patients had to be in the range of scores between 6 and 4.

All patients in this study read, agreed and signed an informed consent before treatment.

The study protocol conformed to the guidelines of the 1975 Declaration of Helsinki and was approved by our institutional review board.

Imaging System

The VeinViewer™ (V-V) Imaging System (Luminetx, TN, USA) allows visualization of feeder veins. The images are acquired and re-projected in a fraction of a second, directly onto the skin, enabling clinical practitioners to visualize what is not possible to the naked eye. The deepest vein identified by the V-V was 0.8mm in diameter and 7.8mm deep.¹

The V-V works by increasing the contrast of veins by digitally imaging a continuous spot-image over the skin using an infrared camera, enhancing the acquired image via software, and then projecting the enhanced vein image in green light over the same spot.

The Duplex machine used in this study was the Pico™ (Medison). It has a linear multi-frequency probe (7.5-10MHz) designed for superficial examination. All saphenous vein reflux evaluations were performed by the

Table 1: Patient stratification according to their venous lesions

	Combined Telangiectasias (With Feeder Veins)	Simple Telangiectasias (Devoid of Feeder Veins)	No Telangiectasias
Complex Varicose Veins (With Reflux on Saphenous Veins)	9	8	7
Simple Varicose Veins (No Reflux on Saphenous Veins)	6	5	4
No Varicosities	3	2	1

authors. The operators are trained specifically on venous examination and perform these on a daily basis.

Laser System

The Nd:YAG 1064nm laser module (Harmony™, Alma Lasers Ltd - Caesarea, Israel) allows the use of different spot sizes (6 and 2mm), long (40, 60msec) and short (10msec) pulse durations, and fluence of up to 150J/cm² and 450J/cm² with 6mm and 2mm spot size, respectively. Recently developed transdermal lasers, like the one we use, achieved selective photothermolysis by being much more absorbed by oxi and deoxi-hemoglobin than melanin. The use of gel is dispensable and patient can easily tell the size of the vein by the generated heat on a smaller or larger vein.

Cooling System

The Cryo5™ cold air device (Zimmer Elektromedizin - Ulm, Germany), developed initially for physical therapy, is intended to minimize pain as well as decreasing the sclerosant's temperature. The Cryo5 decreases the air temperature to -20°C. Cold air is blown upon the region of interest via a flexible hose with a plastic tip. It is consumable free and allows pre, parallel and post cooling.

The CLaCS treatment guided by the V-V

CLaCS is an acronym for the combined treatment we use since 1995. It stands for Cryo-Laser and Cryo-Sclerotherapy.

Initially, all veins were first treated with transdermal laser. Laser was applied with the 6mm spot size, 40ms pulse-width and 130J/cm² fluence (energy). If the pain was bearable, fluence was increased up to 150J/cm², in 10J/cm² steps. For feeder veins, 60msec pulse duration was preferred. The laser session has 50 to 350 shots taking 5 to 25 minutes.

Depending on the coverage of the laser session, the sclerotherapy was started 5 to 25 minutes after photothermolysis. The sclerosing agent employed was 75% hypertonic dextrose

(D75, pharmaceutical grade, one of the most common in Brazil), which is just the same as the intravenous solutions commonly used in hospitals, but in a higher concentration (5% and 25%). It was injected using 3ml syringes, and 27G½ needle. Patients were asked not to use any kind of creams on the day of the session. After the punctures, a handmade 3mm cotton ball was positioned onto the skin with an adhesive tape (Micropore™).

Both techniques were applied with a forced air-cooling device. No compressions, medical stockings or bandages were used. The suggested interval between sessions was 2 weeks.

Photography and outcome analysis

A Tripod mounted Nikon D70 with 28-70mm lens was used. The pictures were acquired in 6Megapixel RAW files, then converted to JPEG set to "Best quality" (lossless compression). Results were analyzed by comparing before and after photos, mainly considering the subject's opinion on the outcome. Response to the treatment was rated on: 1. total or partial improvement with patient satisfaction (Group 1); 2. partial improvement or lack of resolution, without patient satisfaction (Group 2).

Statistical analysis

This is a retrospective study. It was based on the analysis of the data that we normally collect in our files.

Data are presented as mean values and results in each group are cited as percentages.

Results

A total of 466 patients visited the clinic and 191 were selected to start CLaCS treatment during the period of the study. Exclusion criteria left a total of 140 patients for analysis.

Mean age of patients was 37 years (16 to 72), with prevalence of women (98%).

No allergic reactions, systemic reactions, skin burns, post-sclerotherapy mattings, infections or crustings were observed. Ecchymosis were observed in 30% of the cases, and intravenous

coagula in 14% of them. No frostbite was registered due to cold air blowing.

Average number of sessions for the CLaCS was 3.17 (1-9) for Group 1 and 3.58 (1-10) for Group 2.

Pain was described as perfectly tolerable using the cold air device. The clinical protocol was followed to the letter and laser fluence was not lowered in any patient to mitigate pain.

Due to the nature of the technique, the number of punctures was always lower than the number of laser shots, building on the fact that after 15 minutes many of the treated veins were already collapsed.

In 121 patients (86%), partial or total lesion improvement was obtained, with satisfactory cosmetic results.

Unsatisfactory outcome was observed in 19 patients (14%) due to no response or lesion worsening, thus crochet hook phlebectomy was indicated. Two of these patients insisted to be treated by CLaCS, and surgery was suggested to the other 17. Seven patients eventually underwent phlebectomy, with cosmetic improvement in all of those. These surgical procedures were carried out with local anesthesia and in dedicated room.

Example of treatment results is demonstrated in Figures 1 and 2.

Discussion

The ideal sclerotherapy treatment should be safe, efficient, fast, easy to perform, cheap and result in a good cosmetic outcome.

The most discussed and widespread method is foam sclerotherapy. It is cheap, easy to perform and efficient, but it falls short on outcome, not

to mention the incidence of hyper-pigmentation and systemic complications, albeit rare.

Nevertheless, the final choice of technique is the therapist's discretion.

Our practice focuses on varicose veins since the 60's. In the 70's, patients in Brazil started to bring cosmetic concerns outnumbering those with functional symptoms. Understanding this cosmetic bias, we decided to steer clear from risks like anaphylaxis.

This is a retrospective study performed on a private clinic. We cannot randomize patients and compare to foam therapy, as that would demand comparable expertise such agent.

Moreover, patients frequently ask about risks of complications. The main reasons for that are alarmist media reports on TV shows and weekly magazines of iatrogenic complications and deaths related to cosmetic treatments in Brazil.

Our team and patients praise the fact that, for us, CLaCS technique is superior to phlebectomy and foam under two aspects:

- CLaCS guided by the V-V versus Phlebectomy: faster, simpler, costs less, has
 - no down time, is less invasive and uses no medication.
- CLaCS guided by the V-V versus foam technique: no risk of anaphylaxis or
 - embolism.

Although telangiectasias are clearly visible to the naked eye, feeder veins are often not. It is hypothesized that the inefficiency of the treatment modalities herein in the past was due to invisible feeder vein(s), rather than any inherent weakness of the injection or laser sclerotherapy. A single or a few feeder veins may feed the telangiectasias.

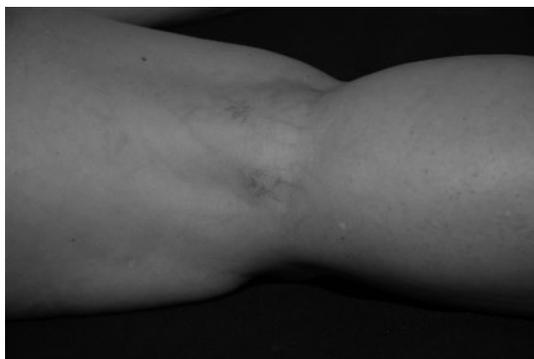


Figure 1: Lesion aspect before treatment



Figure 2: Lesion aspect after three treatment sessions

Telangiectasias may present themselves as simple or combined. The simple ones are groups of small visible tortuous superficial vessels, resembling a light bolt. The combined ones have just the same appearance but are associated to a thicker vessel (feeder vein) that provides pressure to the formation instead of draining it.

Treating telangiectasias, combined or simple, is tricky. Up until now, the physician's experience was the best tool for finding and treating feeder veins, regardless the choice of technique^{2,5-9}. These veins are located beneath the skin, in the subcutaneous tissue, 1 to 6mm from the epidermal surface.

The V-V was initially developed as an aid to collect blood and inject IV medications, but it proved to offer excellent detection of feeder veins. In a previous study, feeder veins were diagnosed in all subjects.¹ One unique feature of the V-V is the fact that the processed image is projected directly over the vein, onto the skin, enabling easy marking and transoperative checking. Additionally, the room illumination does not need to be special, nor does it have to be turned off such as for IR transillumination application

The improved definition of modern ultrasound devices allowed its use to detect and mark feeder veins. Operator's experience translates the accuracy on spotting vessels on the monitor and marking them onto the skin. The smaller and shallower the vein, the less detectable it will be by the ultrasound. Merely positioning the gel and probe can collapse a tiny feeder vein.¹

Ultrasound was our primary tool to locate feeder veins for more than a decade until the V-V appeared. There are still veins deeper than 6mm that the ultrasound is superior to spot. But for the type of vascular lesions within our focus, the V-V is the most comprehensive tool for such layer, since those are too deep for naked eye visualization and too shallow for ultrasound detection.

Ultrasound may be used to improve control over the volume/extent on foam sclerotherapy. On the same fashion, for smaller and more superficial veins, the V-V can be used to improve control over foam therapy. As the V-V films the skin on infrared during foam therapy, foam absorbs and scatters infra-red differently from blood, allowing to track the foam filling

the vein and helping to control the extent of treatment.

In our experience, transdermal laser alone or solely injections of D75 are efficient if the patient scores 2 in table 1, but that is not the most common scoring. We understood the need of a more potent effect to treat patients scoring 3 to 6, thus leading us to CLaCS.

When treating facial veins, the same transdermal laser device is used but with less energy. These veins may have the same diameter of a leg vein but facial veins have thinner walls, are shallower and have lower hydrostatic pressure⁴.

Being D75 allergy-free makes it one of the most popular in Brazil, resting ethamolin to the second place. In spite of that, many practitioners consider it a medium power sclerosing agent, pointing this as a limitation¹⁻³.

For that sole reason, we used it from the 70's on until the appearance of light-emitting devices. Combining both only demonstrated better results in fewer sessions, while no complications emerged. Improvement of outcome through the years, mainly because of better laser treatments, enabled us to treat larger veins, and obtain results that could be achieved only through phlebectomy years before.

Cooling is important to avoid thermal injury to the skin, as well as for pain control, also allowing the use of higher fluences.^{3,7,14}

On the CLaCS method, laser comes first. The reason for that is that the laser tip is not sterile. Besides that, after phlebotomy, an adhesive tape with a cotton pellet dresses the skin, impeding the laser applications. Laser or dextrose alone have indications and proven results. CLaCS is a method that benefits on the synergy of both.

We do not use compressions stockings since the 70's. South American and European body types are peculiarly different concerning inferior limbs. Stocking moldings come from Europe, often inadequately fitting Brazilian patients. Most of our patients complained about absolute discomfort wearing them along the day. Custom made stockings shall be the best option, and these are available today through digital modeling.

Compulsory photo documentation was crucial to help the development of CLaCS technique and evaluate the results of this study. We also think that it is imperative to any cosmetic treatment not only to evaluate outcome but

also for legal reasons. More over, patients often forget their legs' initial state. It has already been proved that subjective similarity may change as a function of temporal distance¹⁶.

Careful selection of patients gave to 86% of those with varicose veins (without saphenous incompetence) the opportunity of being treated with a minimally invasive and safe method.

A more effective outcome is observed (like seen in detergents) without the risk of embolism or anaphylaxis.¹² The CLaCS treatment showed a lower incidence of hyperpigmentation in comparison to previous studies.¹³

Hypothesis: laser injury leading to edema, resulting significant reduction of vessel diameter - less blood, less blood clotting, less hyperpigmentation.

The low index of complications of this allergic-free therapeutic method is very appealing to phlebologists willing to treat telangiectasias with feeder veins.^{12,15}

V-V shows a dynamic image projected over the skin. With this technology, blood can be seen filling the vein. After the laser therapy, vein spasm and blood coagulation can be noted (Figure 3).

So, the V-V shows where sclerotherapy is to be performed (where a vein is still open after laser). The blood gets dammed in these segments and prolongs the contact of D75 with the endothelium.

Pain management is also very important. The Cryo unit blow numbs the skin by decreasing temperature bellow 10°C in seconds (measured by laser aimed infra-red thermometer). It is a medication-free method and frostbite was never observed since we started to use Cryo for this purpose in May 2002.

It is described that lower extremity telangiectasias can be effectively treated with either sclerotherapy or 1064nm long pulsed Nd:YAG laser. Injection sclerotherapy has a lower cost, but laser treatment has the advantage of being non-invasive and focal. It can be used in patients with telangiectatic matting, needle phobia, or sclerosant allergy.⁸

In our experience, CLaCS is obviously more expensive than conventional sclerotherapy, but the cost of CLaCS is lower than phlebectomy. Surgery costs, in our clinic, are about 20 times higher than one CLaCS session.

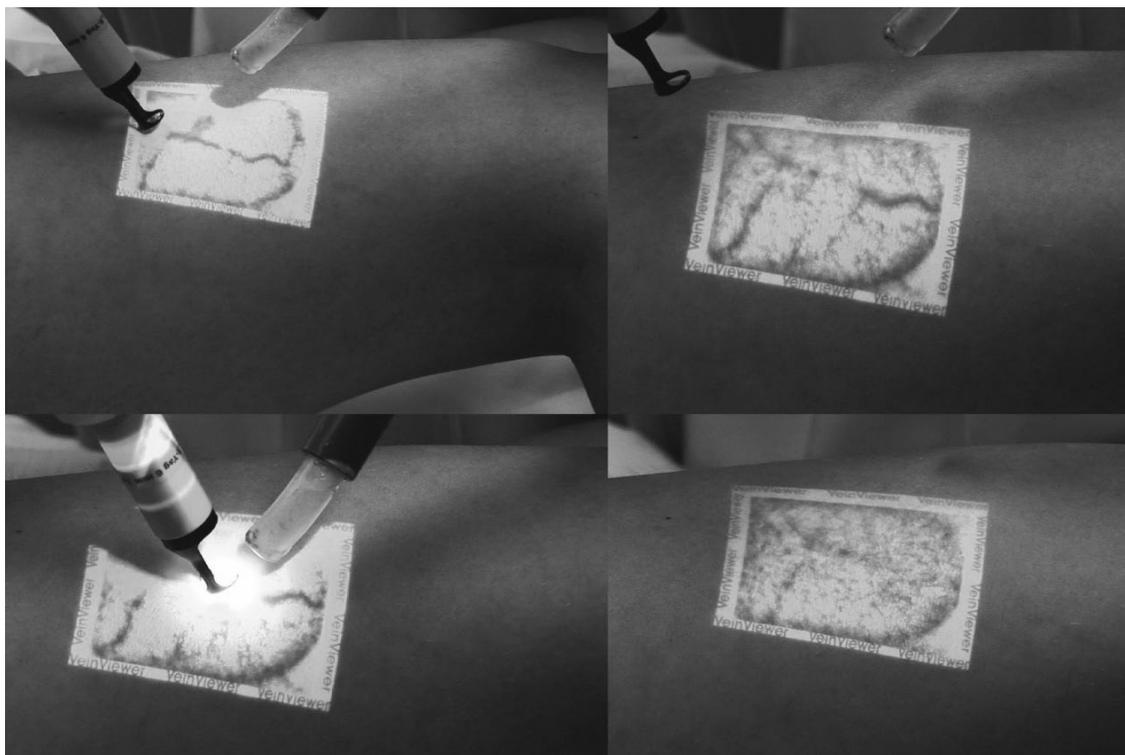


Figure 3: Vein spasm after laser therapy

CLaCS technique may not have a good cost-benefit in other countries. Colder climate, different leg exposure habits/religious concerns will probably relegate the importance of eliminate telangiectasias.

To add on, we don't think that a city's economy or importation taxes are limitations, being Brazil a third-world country. Our imported equipments costs normally 2 to 3 times more than retail price in the US - and we still have a good cost-benefit relation even so.

It is important to study the comparison between laser and sclerotherapy, and their association^{2,10,11}. Even though, for results that are essentially subjective to evaluate, such design shall be difficult to accomplish. Since D75 sclerotherapy provokes no important complications, neither does add up to costs significantly, we stress out its convenience regarding the clear synergy with laser to achieve patient's satisfaction. It is worth to mention that a smaller number of sessions is indeed observed.

CLaCS guided by the V-V may appear a lot of unnecessary and expensive technology. But the same criticism was tossed upon "new technologies" like the steam locomotive, telephone, computer and Internet. Quoting Albert Einstein: "if at first the idea is not absurd, then there is no hope for it".

The four phlebologists that used the V-V during this study provided us the following comments on the device:

Advantages of the V-V (beside projecting onto the skin a hidden vein):

- Good headroom (40cm) to operate under the projector over the bare skin enabled to execute each technique unaltered;
- To follow the vein reaction/contraction after the laser shots;

- To spot segments where the vein is still open – to apply sclerosant;
- To track the sclerosing agent inside the vein;
- To spot the occasional intravascular coagulum from previous session and guide its removal;
- To help patients understand the real complexity of the treatment because of the feeder veins underneath.

Disadvantages:

- The lack of a handle and necessity of adjusting its position constantly;
- Too much space occupied because of the 1.0 m diameter tripod base;
- Difficulty to move up and down with the tripod handle to focalise;
- Unavailability outside the United States of America.

Conclusion

CLaCS guided by the V-V is an option to treat telangiectasias, reticular and feeder veins. It is a safe method based on the employment of recent technology and an organic sclerosing agent. It dispenses the use of any other medication, thus being free of risk of anaphylaxis or embolism.

Comments:

This paper is about a new technology that helps physicians to perform treatment of leg veins. The equipment was loaned by Luminetx. First author has stock options with Luminetx.

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