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TREATMENT OF CUTANEOUS SPIDER VEINS USING LONG PULSE 1064NM ND: YAG LASER

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ABSTRACT
Lower extremity spider veins affect approximately 40% of women and 15% of men, with higher prevalence in women and underlying genetic and hormonal factors. Higher occurrence is found in our societies in which occupational health and obesity also play a role as underlying predisposing causes. Women are also more concerned about the aesthetic aspects of spider veins,which prompts them to seek treatment. Although spider veins have no major medical risks, the demand for aesthetic treatment of these veins continues to grow all over the world. The aim of the study was to determine the efficiency and safety of 1064 nm Nd YAG laser in the treatment of spider leg veins. Ten patients with lower limbs spider veins were included in this prospective study. They were treated with a long pulsed (Nd: YAG) laser in no contact technique using the following laser parameters (wave length 1064nm, energy 30-73 J, pulse duration 10- 30 ms, frequency 2Hz, spot diameter 3- 7mm). Laser therapy was performed on day zero and day fourteen. Clinical assessments were carried out before laser therapy and immediately after the first laser therapy, 2 weeks, 4 weeks, and 6 weeks later. Results showed that there was a remarkable improvement for 80% of patients after the third treatment. Only five patients showed a complete disappearance of the spider veins with no significant intraoperative and postoperative pain and complications, within short operative time. **Conclusion:** The long pulsed (Nd: YAG) laser (1064 nm) is an effective and safe treatment option for lowerlimbs spider veins.

INTRODUCTION
Spider veins are small veins that can appear on the surface of the legs or face. Spider veins can be blue, purple, or red and may appear in the form of thin lines, webs, or branches. People sometimes also refer to them as thread veins. They are usually not painful or harmful, but some people may wish to treat them for cosmetic reasons. Spider veins on the lower limbs are very common and have been reported to be present in 41% of women over the age of 50 years in the United States.[1] Spider veins occur in two-thirds of patients before the age of 25, and increase in incidence with age. They represent an important aesthetic problem.[2]

Telangiectasias, also known as spider veins, are small dilated blood vessels[3] that can occur nearthe surface of the skin or mucous membranes, measuring between 0.5 and 1 millimeter in diameter.[4] These dilated blood vessels may be developed anywhere on the body but are commonly seen on the face around the nose, cheeks and chin. Dilated blood vessels may also bedeveloped on the legs, although when they occur on the legs, they often have underlying venous reflux or "hidden varicose veins". Many factors cause spider veins such as; genetic factors, Venous hypertension.[5] Also, there are predisposing factors to the development of varicose and telangiectatic leg veins include; Age, Gender[6], Pregnancy[7], Lifestyle/occupation.[8]

Acquired telangiectasia, not related to other venous abnormalities, for example on the face and trunk, can be caused by factors such as; Cushing's syndrome, Acne rosacea, Blepharitis[9], Environmental damage. Age[10], Trauma to skin, Radiation, Chemotherapy, Carcinoid syndrome, Limited systemic sclerosis/scleroderma (a Scleroderma sub-type),Chronic treatment with topical corticosteroids may lead to telangiectasia[11], Tobacco smoking.[12] Compressed socks can help prevent spider veins forming. Certain lifestyle changes and self-care tips can help prevent new spider veins appearing or stop existing ones from getting worse. These include; Wearing sunscreen, applying sunscreen, use sun-

protective hats and clothing when outdoors for extended periods, maintaining a healthy weight, wearing compression stockings, staying mobile, avoiding tight clothing, avoiding the overuse of hot tubs and saunas, limiting alcohol consumption, getting regular exercise, elevating the legs, seeing a dermatologist, using cover-up products.

Sclerotherapy is typically considered the first line of treatment for leg veins smaller than 4 mm in diameter. Frequent side effects are pain and hyperpigmentation, caused by hemosiderin deposition through extravasated erythrocytes or by post inflammatory hyper melanosis. Rarely, systemic allergic reactions, skin necrosis, and thrombophlebitis may occur. Moreover, patients with needle phobia may have aversions to this invasive procedure.[13] Lasers have been used to treat dilated leg veins since the 1970s.[14]

Lasers have some theoretical advantages compared with sclerotherapy for treating leg telangiectasias. For example, the risk of hemosiderin deposition would be expected to be lower, as blood vessels are effectively coagulated, preventing inflammation and extravasation of erythrocytes. Early treatments used a variety of wavelengths and radiant exposures resulting in lack of vascular selectivity and thermal confinement leading to unacceptable results, hyperpigmentation, and scarring in many cases.[15]

Their mechanism of action is based on the theory of selective photo thermolysis.[16]

Sclerotherapy, laser and intense-pulsed-light therapy, radiofrequency (RF) or laser ablation[7], and ambulatory phlebectomy are the modern techniques used to ablate varicosities. Numerous reports describe success rates of greater than 90% for less invasive techniques, which are associated with fewer complications, with comparable efficacy.[17]

A variety of lasers[18], and light sources[19] have been used to treat small superficial red telangiectatic vessels on the lower extremities. However, the challenges remain in treating lower extremity deeper telangiectasia and larger reticular veins.[20] These vessels, which are under increased hydrostatic pressures, tend to be larger and blue in color.

The first study on the selective use of a 1064-nm laser on leg telangiectasias and reticular veins was reported by Weiss and Weiss in 1999.[21] Previous applications of this laser were limited to deep laser coagulation of tissue, large hemangiomas and vascular malformations without considering selective targeting. These investigators demonstrate that the 1064 nm wavelength is much more effective in the treatment of 0.5–3.0 mm dilated leg vessels than that of the shorter wavelength lasers used previously. The longer wavelengths allow for increased penetration of light into the dermis. The advantage of Nd: YAG laser over alexandrite and diode lasers is that with equivalent absorption of blood, the 1064 nm laser has weaker melanin absorption and can penetrate deeper. Newer longer-pulsed millisecond Nd: YAG lasers provide longer pulse durations to heat larger caliber blood vessels while at the same time providing adequate coolingto protect the epidermis.[22]

With this technique, blood vessels are selectively obliterated while sparing the surrounding tissue based on three essential requirements: (1) a wavelength that penetrates deeply enough and is preferentially absorbed by hemoglobin, (2) pulse duration less than or equal to the thermal relaxation time of the target structure, and (3) sufficient radiant exposure to cause irreversible damage to the target structure.[12]

Nowadays, all vascular laser modalities are based on this principle.[3]

In this fashion, laser and light devices have become refined during the past several decades, leading to our current ability to apply high fluences to tissues very specifically resulting in selective destruction of unwanted lesions while sparing the patient from nonspecific side effects such as crusting, bleeding, scabbing, or scarring.[14]

By targeting oxyhemoglobin, energy is transferred to the surrounding vessel wall. Currently, the 1064-nm Nd: YAG laser and the visible/near infrared (IR) intense pulsed light (IPL) devices both give good results. The main difference, however, either Nd: YAG lasers can penetrate much deeper and are therefore more suitable for the treatment of larger, deeper blood vessels such as leg veins, or its lower absorption coefficient for melanin, there is less concern for collateral epidermal damage so it may be more safely used to treat darker pigmented patients. The risk for post inflammatory hyper pigmentation can further be minimized by epidermal cooling devices.

Epidermal cooling is imperative to safeguard against collateral damage from melanin absorption. Also, Longer wavelengths more uniformly than the shorter wavelengths with higher absorption coefficients.[2,15,16,18]

PATIENT AND METHODS

This study was done in the clinics of the Institute of laser for postgraduate studies beginning from July 2020 to the end of February 2021.

Ten female patients (22–52) years old with leg spider veins were treated with long pulse laser 1064nm Nd: YAG laser, (3-6) mm diameter spot size, frequency 2Hz, pulse duration (10-30) ms, and energy (30 -74) J. This postoperative study was done in the laser medicine research clinics of the Institute of laser for postgraduate Studies / University of Baghdad from July 2020 until the end of February 2021. Clinical assessments were carried

out before laser therapy and immediately after the first laser therapy, 2 weeks, 4 weeks, and 6 weeks later. Each patient was getting ready for the procedure after full explanation and discussion regarding the nature of the procedure, the possible advantages and disadvantages, and complications expected. At the end of discussion, each patient was asked to sign an "informed consent" indicating the agreement.

Prior to laser therapy patients asked to shave the area of spider veins (if hair is present, it will absorb the laser energy and causing discomfort).

Patients lying after having put topical anesthesia (EMLA) for an hour. A test dose was performed at the initial consultation, and thereafter patients were reviewed and treated at 3-week intervals. However, in some cases, until achieving our desired clinical results, we increased fluence after decreasing the pulse width.

In< 0,5mm leg telangiectasia, maximum fluence was increased up to 400 J/cm2 with 3mm spotsize at the skin surface.

The average time taken for completing the procedure was (20 min.).

Proper eye protection for patient, physician and anyone else in the room is essential when using this laser. External skin cooling and topical anesthesia is optional.

All patients were advised to avoid sun exposure of treated area two weeks following lasertreatment in order to minimize the appearance of hyperpigmentation.

RESULTS

The demographic description of the patients is shown in the table below

Case no.	gender	Age(year)	Occupation	Duration of symptom (year)
1	f	24	Pharmacist	5
2	f	37	Lecturer	10
3	f	47	Employee	13
4	f	41	Dentist	15
5	f	42	Dentist	7
6	f	50	Doctor	15
7	f	42	Women's haircut	11
8	f	24	Housewife	5
9	f	40	Dentist	15
10	f	29	Teacher	10

The results of this study depend on clinical examination and preoperative observation by inspection preoperatively, patient reactions during operation and postoperatively fallow up.

For five (50%) patients the spider veins after three sessions at interval two weeks between every other session has completely disappeared. At the other hand, the other five patients, three (30%)patients of them have improvement after four sessions but the spider veins not completely disappeared.

The last two (20%) patients don't response to the laser therapy. All patients tolerated theprocedure.

There were all patients have a mild discomfort or mild burning sensation (tolerable) regarding. In almost all patients, no allergic reaction, no cutaneous manifestation seen like; purpura, scarring or pigmentary changes were observed at the end of follow up.

There was no need for hospitalization; none of the patients encountered any immediate intraoperative or postoperative complications.

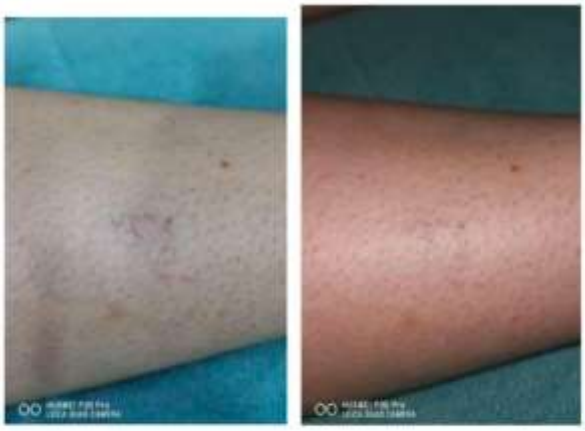
Patients don't need any analgesic and can resume their routine activities immediately post operatively. There was no recurrence detected during the follow up period which was 6 weeksafter the laser sessions.

Table: the results after laser therapy.

Case No.	Age(year)	Site (lower limb)	No. of session	Degree of improvement	Patients Satisfaction%
1	24	bilateral	4	cleared	70
2	37	unilateral	3	cleared	80
3	47	bilateral	4	cleared	50
4	41	bilateral	3	No response	20
5	42	bilateral	2	Improved	60
6	50	bilateral	5	Cleared	75
7	42	bilateral	4	Cleared	80
8	24	bilateral	3	Improved	75
9	40	bilateral	4	No response	20
10	29	bilateral	3	improved	70

(a) before (b) after 2wk.

The pictures below show the response in a patient treated from spider vein in her leg:



(c) after 4wk (d) after 6wk

Before treatment

After 6 weeks of treatment.

DISCUSSION

Lower extremity spider veins affect approximately 40% of women and 15% of men, with higher prevalence in women and underlying genetic and hormonal factors. Higher occurrence is found in our societies in which occupational health and obesity also play a role as underlying predisposing causes.[23] Women are also more concerned about the aesthetic aspects of spider veins, which prompts them to seek treatment. Although spider veins no major medical risks, the demand for aesthetic treatment of these veins continues to grow all over the world.[56] Without intervention, approximately 50% of these cosmetically disturbing "leg veins" can progress and develop into a severe venous dysfunction.[23] The therapy of spider veins of lower extremity is more challenging than that of facial telangiectasias, since they have a larger diameter, a thick surrounding adventitial tissue, are located deeper and are exposed to greater intravascular pressure.[24]

In our study, there are 50% patients with spider veins who have completely cleared after three sessions (six weeks) due to response to long pulse Nd: YAG laser 1064nm, (3-6) mm spot diameter, frequency 2Hz, pulse duration (10-30) ms and energy (30-74) J. this supported by Mardukh S. Ali in (September 2018) for six (60%) patients there was a disappearance of the spider veins.

Another study declared that Nd: YAG was superior to both diode laser and alexandrite in treating leg telangiectasia. Also, they concluded that there were more problems with alexandrite laser than the others.

According to the scarce evidence available, the Nd: YAG laser produces better clinical results than the alexandrite and diode laser. Penetration depth is high, whereas absorption by melanin islow, making the Nd: YAG laser suitable for the treatment of larger and deeply located veins and for the treatment of patients with dark skin types.[24]

On the other hand (30%) patients with spider veins improved after 6 weeks not completely cleared. That occur because of patients uncommitted in their visits. Or uncommitted in recommendations post operatively.

The last two patients (20%) who show no response, they may be multiple veins or big diameter and also patients uncommitted and neglect their selves.

Comparing the results of laser therapy of spider lower limbs veins with (injection) micro sclerotherapy shows that with the using laser these advantages will be achieved: Shorter operative time, Mild or no postoperative pain, no postoperative complications detected, shorter healing time, no postoperative compression bandages were needed. It seems that the parameters chosen for photocoagulation were safe with no apparent damage to nearby tissues and no complications detected in the treated area.

CONCLUSION

This study concluded the long pulse Nd YAG laser 1064 nm is effective in the treatment of spider leg veins. This

effectivity depends on some factors: the duration, size, number of spider veins. Also, this procedure is easy and safe to be performed., and with minimum adverse effects.

Recommendations

1. Increase the number of cases included in the study to verify a statistical analysis of the result.
2. Should be increase the period of fallow up.
3. Use other types of lasers in treatment of spider veins, and telangiectasia in allthe body.

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