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Comparison and Sequential Study of Long Pulsed Nd:YAG 1,064 nm Laser and Sclerotherapy in Leg Telangiectasias Treatment

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Background and Objectives: Millisecond pulsed 1,064 nm Nd:YAG lasers have been developed for the treatment of leg telangiectasias. To date there have been very few side by side comparison studies of laser versus the gold standard sclerotherapy in treating small leg veins. This study aims to compare a long pulsed Nd:YAG laser with contact cooling to sclerotherapy for treating small diameter leg telangiectasias by evaluating objective and subjective clinical effects.
Study Design/Patients and Methods: Fourteen patients were selected with leg telangiectasias ranging from 0.5 to 2 mm at four comparable sites. One site was treated with long pulsed Nd:YAG alone, the second received sclerotherapy alone, the third laser then sclerotherapy, and the last one sclerotherapy then laser. The patients were followed up at 3 months after the last treatment. Photographs were taken pre-operatively and at 3 months after the last session. They were used for objective and comparative analysis. Statistical analysis was performed using Friedman's test controlling for subject.
Results: Improvement was tabulated from the photographic assessment on an improvement scale from 0 (no change) to 4 (greater than 75% clearing). There were clinical improvements in the laser group than sclerotherapy without statistical significance. Side effects were minimal and included hyperpigmentation.
Conclusions: This pilot study demonstrates that the Smartepil LS long pulse Nd:YAG 1,064 nm laser can yield results similar to sclerotherapy in the treatment of small leg telangiectasias. Combination of both methods could increase response to treatment. Lasers Surg. Med. 34:273–276, 2004. © 2004 Wiley-Liss, Inc.

Key words: leg telangiectasia; long pulsed Nd:YAG 1,064 nm laser; sclerotherapy

INTRODUCTION

Sclerotherapy is a very wide and cheap technique for treating vessels from 0.5 to 5 mm since early 1900s. Injecting sclerosant agents into the telangiectatic structure using a small 30-gauge needle is considered as the gold standard of leg telangiectasias treatment by most practitioners. In some patients, it is associated with some limitations, including the possibility of hyperpigmentation [1], telangiectatic matting, and in some cases systemic allergic reactions to the injected sclerosant, post-treatment ulceration, and scarring.

For over 20 years, many different lasers systems have been evaluated for effective eradication of unsightly leg veins. Recently, long pulsed Nd:YAG 1,064 nm lasers [2] have been shown to be successful in treating the blue and purple leg telangiectasias.

Currently many sessions are needed to obtain clearance with lasers or sclerotherapy. This study aimed to compare one session with a long pulsed Nd:YAG 1,064 nm laser (Ellen, DekaMela, Florence, Italy) to sclerotherapy in different sequences.

PATIENTS AND METHODS

Patients

Fourteen women, ages 27–68 years (mean 45 years), skin phototypes 1–4, with superficial leg telangiectasia (diameter range 0.5–2 mm) were included for study.

Patients with clinical evidence of severe vascular incompetence, underlying reflux detected by Doppler blood flow, pregnancy, lactation, previous sclerotherapy 6 months before the study, deep or superficial vein thrombosis were all criteria for exclusion.

We include patients with resistant telangiectases. Resistant telangiectases were defined as a patient with at least two sessions of sclerotherapy with two different sclerosant agents 6 months before protocol study without improvement.

Calculating distances in millimeters, and the exact treatment sites for clinical, photographic, and Doppler flow evaluations were noted for each patient from different anatomic marks. They were then precisely located on tracing paper where the telangiectases, naevi, lentigo, and other selected natural marks were reproduced to allow

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precise identification of the treatment site during the course of the study.

A comparable site on each leg was selected. A plastic template 6×6 cm^2 was used to map each test site and photographed under standardized conditions using digital imaging in vertical positions with Fotofinder (Teachscreen, Griesbach, Germany).

All subjects were advised to avoid sun exposure, at least 6 weeks before and 3 months after treatment by the operator.

Four sites on each subjects were selected for study:

Site1: to evaluate the effect of combined one session laser followed 3 weeks after, by one session of sclerotherapy with Polidocanol (LS) (Kreussler Pharma, Paris, France);
Site2: to evaluate the effect of combined one session sclerotherapy followed 3 weeks after, by one laser (SL);
Site3: to evaluate laser alone (L); and
Site4: to evaluate sclerotherapy alone (S).

Sclerotherapy and Laser Treatment

Both treatments were performed by a skilled operator with 20 years in sclerotherapy and 4 years in laser treatment of leg veins.

For sclerotherapy a syringe of pure Polidocanol 0.5% (Kreussler Pharma) was used.

Sufficient solution to completely push up the blood in the telangiectases and infuse all of its visible branches was injected to obtain complete blood disappearance. This quantity was not specifically recorded. In case of microthrombi, punctures were achieved.

After injection, a small cotton-wool ball was placed over each puncture site and secured with 2.5 cm Transpore tape. Patients were advised to keep these tapes for 24 hours. Compression was not employed and no specific restrictions were placed in patients regarding activities and exercises following the treatment.

With laser, the clinical endpoint was an immediate vasoconstriction with greying aspect without crusts. In some cases, cold packs were used to control pain. The Smartepil LS long pulse 1,064 nm laser (Ellen, DekaMela) was used fluences between 100 and 125 J/cm^2 and a fixed pulse width at 10 millisecond, 2.5 mm spot-size handpiece without connected cooling system. If patient was sensitive, ice pack was used before and during the session.

Thrombosis , erythema, and perivascular oedema should resolve in 24 hours with small crusts during 10–20 days normally.

Assessment and Methods of Statistical Analysis

Patients were followed at 3 months after the treatment in each group. Standardized photographs of the treatments were taken before the treatments and at 3 months after the treatment alone, or the treatment sequence.

At the end of the study, blinded observers to the study graded leg telangiectasias on digital imaging for clearance and side effects. Descriptive statistics were done by treatment type and mean, standard deviation (SD), minimum and maximum for clearance assessment grades were determined.

The following clearance rate/grades were used:

1. no or slight clearing (0–25%),
2. mild clearing (25–50%),
3. almost cleared (50–75%), and
4. complete clearance (>75%).

The Friedman test was used to compare the four different groups. This test is a non-parametric test usually applied to compare three or more paired groups. The whole point of using this test is to control for experimental variability between subjects, thus increasing the power of the test. Since the Friedman test ranks the values in each group, it is not affected by sources of variability that equally affect all values in a group.

Descriptive statistics were done for all patients by using mean, SD, minimum and maximum for age (in years), frequency (n and %) for phototype (I–IV), and side effects (A = hyperpigmentation, O = no side effect). Frequency of side affects was evaluated between the four treatment types (S, L, SL, LS) and also compared using the Friedman test (Fig. 1).

RESULTS

Fourteen female patients completed the study. Mean age was 55.5 (± 9.0), range 39–72 years (n = 14 patients).

Frequencies of 1–4 phototype grades are 15.4, 23.1, 46.2, and 15.4%, respectively.

Clearance Rate

Percents of clearance grades by treatment types are presented in Table 1. Using the Friedman test, clearance grades show no statistical significant difference between treatments ($P = 0.1132$).

Side Effects

Frequency of side effects by treatment types is presented in Fig. 1. Side effects show no statistical significant difference between treatments ($P = 0.1762$). Only hyperpigmentation side effect was observed in 16 test sites (31%).

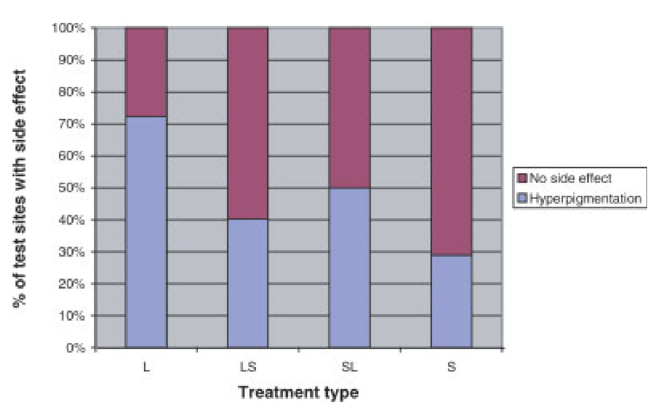


Fig. 1. Frequency of side effects by treatment type.

TABLE 1. Clearance Grade by Treatment Type

Clearance grades	Treatment types, n (%)				
	L	LS	S	SL	All
1	5 (26.3)	6 (31.6)	3 (15.8)	5 (26.3)	19 (36.5)
2	7 (36.8)	4 (21.0)	5 (26.3)	3 (15.8)	19 (36.5)
3	1 (12.5)	2 (25.0)	4 (50.0)	1 (12.5)	8 (15.4)
4	0 (0.0)	1 (16.7)	1 (16.7)	4 (66.7)	6 (11.5)

DISCUSSION

The results of this study show that a long pulsed Nd:YAG 1,064 nm high energy laser can provide a safe and acceptable treatment of 0.5–2 mm leg telangiectasias.

The usual immediate responses considered as a clinical endpoint in most of the published studies are vessel disappearance (vasospasm), or changing aspect and color (thermo-coagulation). If there are no effects after one pass, we never stacked pulses to avoid hyperpigmentation.

Significant clinical improvement of leg telangiectasias was shown in sites treated with laser then sclerotherapy. The best sequence appears to be sclerotherapy then laser with higher clearance (Table 1, grade 4) compared to laser then sclerotherapy (Fig. 2A,B), than laser alone and sclerotherapy alone. These facts were emphasized by MacDaniel et al. [12] with an Alexandrite laser. He assumed that the endothelial cells would be most sensitive to a sclerosant agent when laser is applied.

The 1,064 nm wavelength can provide selective absorption by hemoglobin/deoxyhemoglobin within large leg telangiectasias when used at high energies. Variable fluences are necessary to get high clearance rates of leg telangiectasias from 0.4 to 2 mm with Nd:YAG lasers, for instance 100 J/cm^2 in Omura's study [3] while 320–350 J/cm^2 in Coles's study [4].

When using smaller spot sizes, we observe that pain is reduced and treatment more tolerable despite high energies. Our experience is comparable to Coles's study [4] when she reduced the spot size from 3–5 to 1.5 mm to obtain good results with less pain. In our study 2.5 mm spot appears very useful and painless without anesthetic cream or cooling system.

Similarly, Mordon et al. [5] used a spot-size of 2 mm with 300–360 J/cm^2 but with multipulse mode.

Pulse duration of 10 millisecond seems sufficient for the diameter of vessel that we have treated and no cooling system was necessary. Once again, it is very similar than Mordon's study with three spots of 3.5 millisecond but separated by 250 millisecond delay time in multipulse mode. In this study, very high clearance is observed.

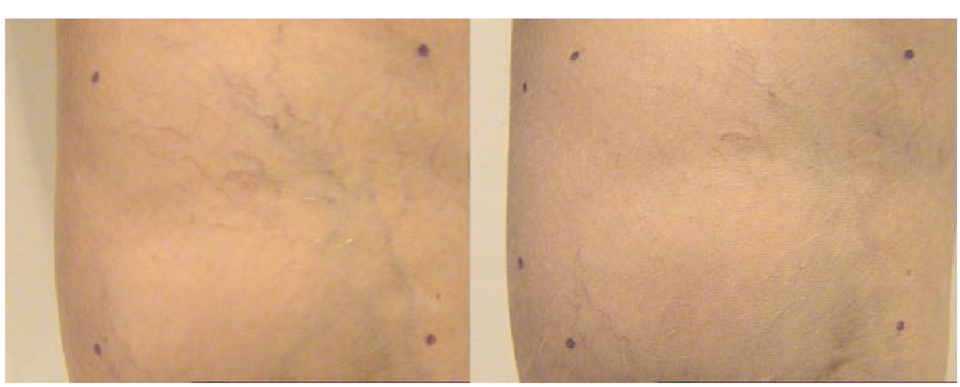
In our study, after only one treatment, improvement is similar than after one session in Mordon's study and with our sclerotherapy sites. Bowes [6] compared Nd:YAG laser 25 millisecond, 6 mm spot, 125 J/cm^2 with a 5 mm spot, 200 J/cm^2, 2 mm spot, 25 millisecond. Results were 72–75% vessel clearance 1 month after the last treatment depending on the cooling system of the laser utilized. Rogachefsky [7] has treated with 2 sessions, 0.25–4 mm vessels, on 10 patients, 2 sites each at 4–6 weeks interval, with fluences 90–187 J/cm^2 and 10–50 millisecond pulse duration, with a follow-up of 3 months. Seventy-one percent of the vessels had a significant improvement. A 62% rate of post-inflammatory hyperpigmentation was observed at 3 months.

Mayor et al. [8] has demonstrated very similar results and transient hyperpigmentation with the same laser system. Lupton [9] compared sclerotherapy and long pulsed Nd:YAG laser treatment on 20 patients. He obtained a better response on very small vessels by sclerotherapy in fewer sessions. The two groups had minimal and equivocal sequelae with mainly post inflammatory hyperpigmentation.

Other laser systems in the green wavelengths have shown to be able to treat small leg telangiectasias. However, they have not been shown to work on larger vessels with two or three sessions to observe high clearance [10,11].

Long pulsed Alexandrite [12] lasers have been shown to work on larger leg telangiectasias, however, these systems often produce purpura and can cause long term pigmentary alterations due to the melanin absorption.

A



B

Fig. 2. Before (**A**) and 3 months after (**B**) sequence: Sclerotherapy then laser. [Figure can be viewed in color online via www.interscience.wiley.com.]

A comparative study of 1,064, 810, and 755 nm lasers was done by Eremia [13] on 0.3–3 mm leg telangiectasias of 22 women, and a follow up of 3 months. Results were graded as percent resolution on photographs and clinically. Seventy-five percent improvement was observed at 88% of the Nd:YAG sites compared to 29% with the diode sites and 33% at the Alexandrite sites. Purpura and matting were a significant drawback for the Alexandrite laser. Pain was sometime sufficient for patient to decline further treatment. They conclude that the 1,064 nm is very safe and efficient for these vessels diameters despite the high pain induced, but the long pulsed diode 810 nm gives unpredictable results and the usefulness of the Alexandrite is limited due to the large amount of important unwanted effects.

On the vessel diameters studied from 0.5 to 2 mm, we observed according to Weiss et al. [14] that both short or long pulses could lead to the same efficacy; it will be different when the treatment is applied on veinulectasias of more than 3 mm. Hyperpigmentation was seen after both laser treatment and sclerotherapy in a total of 31% patients.

This appears to be more related to individual response and type of vessel than with the treatment. Finally the hyperpigmentation observed with sclerotherapy was less frequent (12.5%) than with laser and quite similar to Weiss's study (10.9%) using compression [15] on similar vessel diameter.

Finally, it remains that comparative studies with sequential treatment of different modalities could lead to slow improvement during 3–6 months after a single treatment session.

CONCLUSION

This study emphasizes the use of combined laser Nd:YAG and sclerotherapy at 1 month interval with one session laser. However, no statistical difference was found in this small series comparing sclerotherapy alone or combinations of sclerotherapy and laser. However, the sequence sclerotherapy then laser appears more effective clinically.

The Smartepil LS Nd:YAG 1,064 nm laser emitting a high energy single shot of 10 millisecond provides a safe and effective treatment for vessels from 0.5 to 2 mm of diameter while sparring the epidermis. It also allows to use lower fluences, in a single pulse mode with a very effective pain control.

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