

Use of Long Pulse Nd:YAG 1064nm Laser for Treatment of Rosacea Telangiectatica

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ABSTRACT

A clinical study was performed in which 23 female patients were treated with long pulse Nd:YAG laser light (DualisSP, Fotona, Slovenia) for rosacea telangiectatica.

Patients were treated in one, two or three sessions, depending on facial telangiectasia clearance success. The time interval between sessions was 6 weeks. Treatment parameters were set according to the treated vessel size and depth. Fluences between 160 and 210 J/cm² and pulse durations between 10 and 15 msec were used. The therapy was performed without any anesthesia, only cold air cooling was used for pain reduction. The pain level was measured with a 10 grade visual analogue scale (VAS).

Results of telangiectasia clearance were evaluated on a four grade scale (poor, moderate, good and excellent) 3 months after the last treatment session. All patients experienced marked improvement of rosacea, among them 13 patients had excellent clearance, 8 good and 2 moderate clearance. The treatments were well tolerated and there were no severe side effects. Three patients had hyperpigmentation and one prolonged erythema, which were all transient.

Key words: rosacea, telangiectasia, Nd:YAG lasers

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I. INTRODUCTION

Rosacea is a chronic skin disorder characterized by facial flushing, persistent erythema, telangiectasia, and inflammatory papules and pustules affecting the central face. It is a chronic condition which can relapse and also spontaneously clear so it requires long term treatment. Rosacea can be mistaken for several other cutaneous disorders including acne vulgaris, steroid-induced acne, sunburn, or actinic changes and even

lupus. The flushing and telangiectasias of rosacea can be confused with some other rare disorders as well, including carcinoid syndrome, pheochromocytoma, and mastocytosis.

Many well documented factors result in vascular dilatation, damage and subsequent alterations to the connective tissues in a context of increased activity of reactive oxygen radicals. A chronic inflammatory reaction - with its accompanying flood of inflammatory cells and inflammatory mediators - then leads to the rosacea phenotype: erythema, papules, and pustules. Involvement of the lymphatic system results in edema. Enduring erythema characterizes the first stage of rosacea with telangiectasia of different severity. [1]

The 1064 nm wavelength has been long used for various vascular treatments from port wine stains to a variety of vascular ectasia and pigment applications. Long pulse Nd:YAG lasers (5-60 msec) have given us the opportunity to extend the application of this wavelength to the removal of fine telangiectasia connected with rosacea. The deep penetration depth of the Nd:YAG wavelength combined with the pulse duration matching the thermal relaxation time of targeted vessels, could potentially allow the treatment of these vessels.[2]

II. MATERIALS AND METHODS

Twenty-three female patients with Fitzpatrick skin type I to III were treated with the Nd:YAG 1064 nm laser (DualisSPII, Fotona, Slovenia). All vessels treated in this study varied between less than 1 mm and 1 to 2 mm in size. The depth of vessel location was determined by the color changing from red to purple to blue.

Table 1: Patients by skin type

Fitzpatrick type	No.of Pts	% of Pts
I	9	39,13%
II	11	47,83%
III	3	13,04%
	23	100,00%

Patients were treated with a 2 mm spot size handpiece which emitted a gaussian beam profile. Energy levels were set based on the vessel depth and size. The fluence was adjusted from 160 J/cm² to 210 J/cm²; lower fluence was used for shallower vessels, higher fluence for deeper vessels. Based on the thermal relaxation time of the treated vessels, pulse durations were set at 10 to 15 millisecond throughout all treatments. Repetition rates of 1.5 Hz or below were used. Zimmer CRYO6 air cooling system was used during each treatment to cool down the skin surface and decrease any non-specific thermal effects to the epidermis and underlining dermal layers.

The objective of this study was to determine the extent of capillary clearance and to describe the occurrence of any adverse effects. The clinical end-point during treatment varied with the size and the depth of the vessels. Immediate blanching was seen with some vessels. Color conversion from red to violet color was observed few seconds after vessel irradiation with consecutive pulses. Generally, small sized red and purple vessels blanched with each consecutive pulse.

Immediately after lasing, each vessel was examined with a dermascope after pressure was applied. If blood refilled the vessel an additional pulse or two was delivered to this vessel. Treatment sessions were scheduled every six weeks, up to three treatments. The final examination was scheduled 3 months after the last treatment session.

Inclusion criteria for study were: facial telangiectasia, age between 12-55 years and the willingness to provide signed informed consent before the laser procedure. Exclusion criteria were: pregnancy, actinic damage, steroid dermatitis, contact dermatitis, intake of isotretinoin or other photosensitizers, local application of cytostatics (busulfan, 5-fluorouracil), professional exposure to dyes, current use of warfarin, acetic-salicylic acid or vasodilators which increase the blood flow.

Post-operative treatment included complete restriction of sun bathing, avoidance of blood thinning medications and rigorous application of mineral total sun block creams. All patients were photographed before the first treatment, and three months after the last treatment.

A visual analog pain scale (VAS), was used for accurately determining the pain level during laser treatment. The intensity of pain was graded by the patient with the help of a colored gradient and graduated line from 1 to 10 (Fig. 1). [10]

Results were graded as poor (up to 25% clearance), moderate (26-50% clearance), good (51-75%

clearance) and excellent (76-100% clearance). Patients were observed for prolonged erythema, hypo or hyperpigmentation, as well as scar formation.

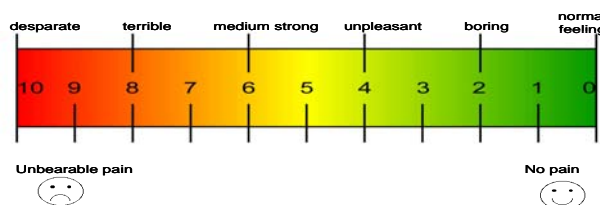


Fig. 1: Visual Analog Scale for measurement of pain during the laser treatment

The patients were interviewed by the physicians for their self-assessment of the improvement of telangiectasia appearance according to the following categories: aggravation, no change and improvement. The patients were also asked to note the presence of any side effects or adverse events.

III. RESULTS

Among the 23 patients, 34 telangiectatic facial areas were treated. In 4 (17.39%) cases, excellent clearance was noted after the first laser session and in 3 (13%), excellent clearance was noted after the second laser session. Three months after the last long pulse Nd:YAG laser treatment, 2 (8.7%) patients showed moderate clearance, 8 (34.78%) patients showed good clearance and 6 (26%) patients excellent clearance with a third treatment. Immediately after the treatment and seven days after lasing inflammatory reaction, slight edema and redness were seen in the group of patients where vessels were treated twice consecutively according to color conversion from red to violet. All that cases were in the group of fast responders (total clearance after first and second laser session).

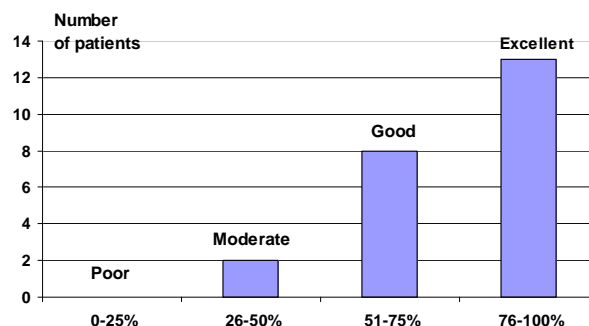


Fig. 2: Three months after the last executed session 13 patients achieved excellent clearance, 8 good and 2 moderate.

All patients showed marked improvement of telangiectasia appearance at the end of study. Side effects were seen in 3 (13%) cases with Fitzpatrick skin type II and concomitant previously marked area of melasma. There was one case (4%) of prolonged erythema which spontaneously resolved in 2 weeks. There were no severe side effects like hypopigmentation or scar formation.

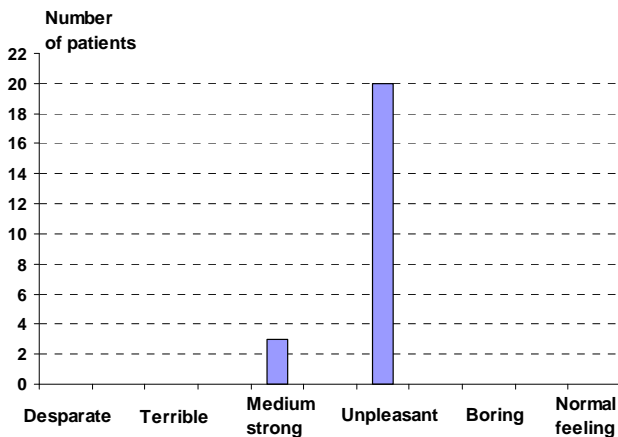


Fig. 3: Most of the patients evaluated the pain level as “unpleasant” and tolerated the treatment procedure well.

In VAS pain evaluation results, 20 (87%) patients complained about moderate pain (unpleasant - level 4 on 10-point VAS) while 3 (13%) patients reported stronger pain (medium strong – level 6 on 10-point VAS).

IV. DISCUSSION

Flushing, with persistent central facial erythema in erythematotelangiectatic rosacea, is probably the most common presentation of rosacea. Although it has been suggested that rosacea is essentially a cutaneous vascular disorder, facial flushing is not always a feature.[1] Rosacea telangiectatica is a common skin condition, but the currently available treatments are not satisfactory. [3]

According to theory of selective photothermolysis the combination of the laser light properties, the energy levels and exposure duration must be optimized to achieve desirable clinical results. [4] The Baumer study found that smaller spot sizes with moderate fluences (100–400 J/cm²) and longer pulse durations (10–100 ms) were most effective and most tolerable to patients. Finding a solution for small vessels up to 1.5 mm in depth with light red, purple or blue and violet color has been a longstanding challenge. Nd:YAG lasers have a great depth of penetration, low absorption in melanin and relatively good absorption in oxyhemoglobin[5]. Black and

Barton showed that the laser photothermal coagulation of blood in vitro is a complicated process involving time and temperature dependent changes in both optical and structural properties [5]. Mordon wrote that met-Hb should account for observations in the treatment of lower-extremity telangiectases using Nd:YAG lasers at 1064 nm [6]. Recent results treating PWS with highly penetrating 1064 nm laser light have indicated that full-thickness burns can occur even with careful selection of laser parameters [11]. One possible explanation for this is the abrupt increase in absorption at 1064 nm resulting from the met-Hb conversion. Black and Barton gave evidence of an Hb absorption spectrum shift, red blood cells shape changes and coagulation on both molecular and macroscopic scales. Heat generation is due to absorption of laser light which denatures the protein by thermal effects. The weak interactions of protein are affected by heat. There are experimental data about decrease of absorption intensity of red blood cells after 70 seconds of Nd:YAG 1064 nm, laser irradiation, because of protein denaturation [5].

Blood vessels with a 0.1 mm diameter have a thermal relaxation time (TRT) of about 5 msec, while a 0.3 mm vessel has a 40 msec TRT, and increasing the diameter to 1 mm brings its TRT up to 500 msec. [4,6,9]. Generally higher fluences and shorter pulse durations were required to blanch smaller and redder vessels



Fig. 4: Rosacea telangiectatica on the patient of skin type II before and 3 months after the treatment

Air cooling associated with telangiectasia treatment provides bulk cooling of the treated area. When held in one position cool air rapidly cools the tissue to temperature very close to 0 Celsius degree.[7] That means that tissue is cooled considerably to some depth which provides significant anesthesia level and reduction of possible side effects. Superficial vessels are protected with cold air cooling but low superficial temperatures – through vasospasm - could also produce a certain degree of slight post treatment edema and erythema.

Side effects were minimal and included three cases of post-inflammatory hyperpigmentation in patients which were very prone to hypermelanosis due to pre-treatment melasma appearance. Subjects described discomfort as moderate. Pain sensation resolved immediately after the laser energy was deactivated. In this study, pulse duration was between 10 and 15 ms, but the small 2 mm spot size allowed the more efficient use of higher fluences up to 210 J/cm². Improvement usually occurred before the sixth week post treatment. These results were seen in the treatment of violet, blue/red and red facial telangiectases. Use of an Nd:YAG laser, such as the one used in this study, allowed for great variations in the chosen fluence and pulse duration. We are able to adjust parameters for individual needs according to vessel characteristics such as color, size, and depth.

Our results are similar to the results of Sarradet et al. where moderate to significant improvement was seen in 73% patients at day 30 and in 80% of patients at 3 months. [8]



Fig. 5: Excellent clearance of Erythematotelangiectatic type rosacea

This NdYAG laser treatment is more acceptable than pulsed dye laser treatment because of lack of after treatment purpura. Patients can resume normal activities immediately without necessarily using any camouflage techniques. There is no need for pre-operative topical anesthesia, nor is there a need for any specific postoperative treatment besides for the application of sun screens on a daily basis.

V. CONCLUSIONS

The long pulse 1064 nm Nd:YAG laser can be effectively and safely used for the treatment of red, purple and violet small telangiectatic blood vessels less than 1 mm and up to 2 mm in diameter with no after treatment permanent skin changes.

Longer follow-up (a year to several years) would be needed to determine the long-term efficacy of our clinical protocol. We believe that even in cases of rosacea relapse this treatment could be easily repeated and used also as long term maintenance therapy for erythematotelangiectatic type rosacea.

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