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Evaluation of long-term efficacy, safety, and effect on life quality of pulsed dye laser in rosacea patients

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ABSTRACT

Background: Rosacea is a chronic disease affecting the patients' life quality negatively. Although various laser systems are used in the rosacea treatment, studies reporting efficacy and long-term continuity of benefit of laser therapies are scarce.

Objectives: We aimed to evaluate the efficacy, safety, continuity of benefit, and effect on life quality of pulsed dye laser (PDL) in the rosacea patients.

Methods: Fourteen rosacea patients treated with PDL were enrolled in the study. The number of treatment sessions were varied from one to four. The efficacy was evaluated by the physicians' clinical assessment (PCA), patients' self-assessment (PSA), and erythema and telangiectasia grading scores. Additionally, the patients were asked about the continuity of the benefit and improvement in their life qualities after the treatment.

Results: Both the erythema and telangiectasia scores were significantly improved after the treatment ($p < 0.001$). According to PCA, nine patients had a clinical improvement of >50%. According to PSA, 11 patients had good/excellent improvement. Moderate/significant benefit of treatment continued in 12 patients at the follow-up period (mean 21.64 ± 14.25 months). The life quality scores were significantly improved. No serious side effects were observed.

Conclusion: PDL has high and long-term efficacy in the treatment of rosacea with a good safety profile.

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Pulsed dye laser; rosacea; efficacy; safety; life quality

Introduction

Rosacea is an inflammatory facial skin disease affecting people in their thirties and forties with chronic outcome. Although the exact cause is still unknown, aberrant inflammatory response to the various triggers with increased levels of cathelicidins has been shown in the pathogenesis previously (1). Rosacea has mainly four subtypes: erythematotelangiectatic, papulopustular, phymatous, and ocular (2). Among these subtypes, the erythematotelangiectatic type is more resistant to the topical and systemic agents than the others. Persistent erythema and telangiectasia have a quite negative impact on the life quality of the patients with rosacea resulting in social anxiety (3).

Diverse lasers and light-based treatments including potassium-titanyl-phosphate (KTP), intense pulsed light (IPL), neodymium: yttrium-aluminum-garnet (Nd:YAG), erbium: yttrium-aluminum-garnet (Er-YAG), and pulsed dye lasers (PDL) are currently used in the treatment of erythema and telangiectasia related to rosacea (4–6). Among these devices, PDL has been utilized in the treatment of various vascular conditions since the 1980s successfully. PDL is regarded as gold standard for telangiectasia related to rosacea with 585–595 nm short wavelength well absorbed by oxyhemoglobin. Relatively short wavelength of PDL and thus short invasion depth also decrease the risk of skin damage (5–7).

However, studies reporting the efficacy and safety of PDL in the treatment of rosacea are scarce. Further, although rosacea is a recurring and chronic disease, it is hardly ever studied whether the PDL treatment can cure the disease in the long term.

We aimed to evaluate the short- and long-term efficacy and safety of PDL in the treatment of rosacea, as well as effect on life quality of the patients with rosacea.

Materials and methods

We conducted a descriptive study including 14 rosacea patients treated with PDL at the Dermato-Cosmetology Department of Uludag University Medical School between 2014 and 2018. Ethic committee approval was obtained prior to the study from Uludag University Clinical Research Ethic Committee. File archive of the patients was reviewed retrospectively and patients who meet inclusion/exclusion criteria were enrolled in the study. Rosacea diagnosis was based on the National Rosacea Society criteria by two dermatologists. Exclusion criteria were the patients with phymatous and ocular rosacea and the presence of any other laser treatment or systemic medical treatment for rosacea in the previous 2 months.

Demographic and clinical characteristics (subtype of rosacea, localization, rosacea severity score, Fitzpatrick skin type, and previous treatments) of the patients were recorded. Rosacea severity was classified using the Investigator Global Assessment (IGA) which grades the disease severity from “0 – clear” to “6 – severe” (8).

The number of treatment sessions was varied from one to four sessions (mode two) with 4–6-week intervals. The 595-nm PDL (V-beam Perfecta; Candela, Boston, MA) was performed according to manufacturer guides for facial telangiectasia with a median spot of 7 mm (range 7–10 mm), median fluence of 8.5 J/cm² (range 8–12 J/cm²), and median pulse duration of 10 ms (range 10–20 ms). A cooling device was used to avoid skin damage simultaneously. No topical anesthetic cream was applied to the patients before the PDL treatment. The patients were prescribed a daily broad-spectrum sunscreen after the laser treatment and instructed to avoid excess sun exposure.

Standardized photographs of the patients were taken at each visit using a digital single-lens reflex camera (EOS 550D, Canon KK, Tokyo, Japan) and used to evaluate the

efficacy. The efficacy was assessed by the physicians’ clinical assessment, patients’ self-assessment, and erythema and telangiectasia grading scores before and 4 weeks after the last treatment session. The physicians’ clinical assessment was performed according to a 5-grade scale; “no improvement – 0%”, “mild – 1–25%”, “moderate – 26–50%”, “significant – 51–75%”, and “excellent – 76–100%” by two dermatologists. The patients were asked to classify their treatment response as “no change or worsening”, “poor”, “fair”, “good”, and “excellent”. Erythema and telangiectasia grading scores consisting a 4-point scale (“absent – 0”, mild – 1”, moderate – 2”, and “severe – 3”) were measured before and 4 weeks after the treatment.

The patients were asked about whether the benefit of laser treatment continued at the follow-up period using the scale of “no benefit”, slightly”, “moderately”, and “significantly”. In addition, improvement in the patients’ life quality after the PDL treatment was asked by a simple questionnaire which modified from the questionnaire of the study of Strand et al. (Figure 1) (9). Side effects related to the treatment and pain scores obtained by a 10-point visual analogue scale were recorded.

Name-surname: _____ Gender: _____ Age: _____

Thank you for your participating in our questionnaire. Please answer the following three questions to the best of your ability.

1. Do you feel the benefit of laser treatment has continued at the follow-up period for your rosacea?
 - Yes, significantly
 - Yes, moderately
 - Yes, slightly
 - No benefit
2. Before beginning the laser treatment for rosacea, how much your rosacea has affected your life quality negatively?
 - Very much
 - A lot
 - A little
 - Not at all
3. After completing the laser treatments for rosacea, how much your rosacea is affecting your life quality negatively now?
 - Very much
 - A lot
 - A little
 - Not at all

Figure 1. Rosacea questionnaire.

The statistical program “SPSS for windows 22.0” was employed for the statistical analysis. The descriptive statistics were demonstrated as mean, median, standard deviation, ratio, and frequency. Paired *t*-test was used for the assessment of treatment response and improvement in life quality of the patients. Kappa statistic was used to measure interobserver concordance; *p* value <0.05 was assessed as significant.

Results

Fourteen rosacea patients (five male, nine female; age range 26–61 years, mean 45.36 ± 8.93) treated with PDL were enrolled in the study. Of the patients, 13 had erythematotelangiectatic type and 1 had papulopustular type rosacea. The mean follow-up period was 21.64 ± 14.25 months (range 1–46 months). Five patients (35.7%) had mild, six (42.9%) had mild–moderate, two (14.3%) had moderate, and one (7.1%) had moderate–severe rosacea. Previous treatments of the patients were topical metronidazole and topical tetracycline (Table 1).

Both the erythema and telangiectasia scores of the patients were significantly improved after the PDL treatment compared with basal scores ($p < 0.001$). Whereas 10 patients (71.4%) had moderate or severe erythema before the PDL treatment, the erythema diminished to the mild levels in the majority of the patients (71.4%) and only one patient (7.1%) had moderate erythema after the PDL treatment. Similarly, whereas 13 patients (92.9%) had moderate or severe telangiectasia before the PDL treatment, only 1 patient (7.1%) had moderate telangiectasia after the PDL treatment. Life quality scores of the patients were also significantly improved after the treatment ($p = 0.001$). (Table 2).

According to the physicians’ clinical assessment, nine patients (64.3%) had a clinical improvement of >50% (Figures 2–3). According to the patients’ self-assessment, 11 patients (78.5%) had good or excellent improvement. The patients’ grading showed a moderate concordance with the physicians’ grading as indicated by Kappa index of 0.440 ($p = 0.008$). Twelve patients (85.7%) reported that moderate or significant benefit of the PDL treatment continued at the follow-up period (mean 21.64 ± 14.25 months) (Table 3).

Table 1. Demographic and clinical characteristics of the study population.

		<i>n</i> (%)
Gender	Male	5 (35.7)
	Female	9 (64.3)
Fitzpatrick skin type	I	2 (14.3)
	II	11 (78.6)
	III	1 (7.1)
Subtype of rosacea	Erythematotelangiectatic	13 (92.9)
	Papulopustular	1 (7.1)
Localization of the lesions	Central face	2 (14.3)
	Cheek	3 (21.4)
	All face	9 (64.3)
Rosacea Severity Score	0 (Clear)	0 (0)
	1 (Minimal)	0 (0)
	2 (Mild)	5 (35.7)
	3 (Mild–moderate)	6 (42.9)
	4 (Moderate)	2 (14.3)
	5 (Moderate–severe)	1 (7.1)
Previous treatments	6 (Severe)	0 (0)
	Topical metronidazole	2 (14.3)
	Topical tetracycline	2 (14.3)

Table 2. Evaluation of erythema grading scale, telangiectasia grading scale, and effect of rosacea on life quality before and 4 weeks after the last treatment session.

	Before laser treatment <i>n</i> (%) or mean \pm SD	After laser treatment <i>n</i> (%) or mean \pm SD	<i>p</i>
Erythema			
Absent (0)	0 (0)	3 (21.4)	
Mild (1)	4 (28.6)	10 (71.4)	
Moderate (2)	7 (50)	1 (7.1)	
Severe (3)	3 (21.4)	0 (0)	
Average	1.93 ± 0.73	0.86 ± 0.54	<0.001
Telangiectasia			
Absent (0)	0 (0)	0 (0)	
Mild (1)	1 (7.1)	13 (92.9)	
Moderate (2)	11 (78.6)	1 (7.1)	
Severe (3)	2 (14.3)	0 (0)	
Average	2.07 ± 0.48	1.07 ± 0.27	<0.001
Effect of rosacea on life quality			
Not at all (0)	0 (0)	4 (28.6)	
A little (1)	2 (14.3)	7 (50)	
A lot (2)	11 (78.6)	3 (21.4)	
Very much (3)	1 (7.1)	0 (0)	
Average	1.93 ± 0.48	0.93 ± 0.73	0.001

Paired *t*-Test.

No serious side effects were observed with the PDL treatment. The main side effects were erythema (100%), pain (85.7%; mode of visual analog scale, 1), purpura (21.4%), edema (7.1%), and crusting (14.3%). All side effects were transient and resolved spontaneously within several days.

Discussion

Rosacea is a relatively common facial skin disease of middle-aged people. Unfortunately, medical therapy is usually inadequate particularly in the treatment of erythematotelangiectatic type rosacea. Patients with rosacea are negatively affected in their social lives because of redness of their faces (3). Therefore, different laser systems have been currently used to improve erythema and telangiectasia related to rosacea (4–6). Since there are limited number of studies about the efficacy and continuity of benefit in the long term of laser systems in rosacea, we conducted the current study. We performed a three-step evaluation to assess the efficacy of PDL which reported as gold standard for rosacea treatment: first clinical improvement, second long-term benefit of PDL treatment in the follow-up, and third improvement in the patients’ life quality. We found that PDL has high and continuous efficacy in the treatment of rosacea with a good safety profile. Moreover, we observed a significant improvement on the life quality of rosacea patients.

Telangiectasia related to rosacea can be treated by lasers targeting hemoglobin as chromophore and light devices rather than the medical treatments. Various laser devices have been compared to detect the most effective and safe laser system in the rosacea treatment. Kim et al. have compared the efficacy of radiofrequency (RF) and PDL in 30 patients with rosacea and found no significant difference between the treatment groups in erythematotelangiectatic subtype, whereas RF was more successful in the patients with papulopustular subtype (10). In the studies comparing



Figure 2. (a) A 49 year-old female with erythematotelangiectatic rosacea before the laser treatment. (b) The picture showing clinical improvement 4 weeks after the last treatment session.

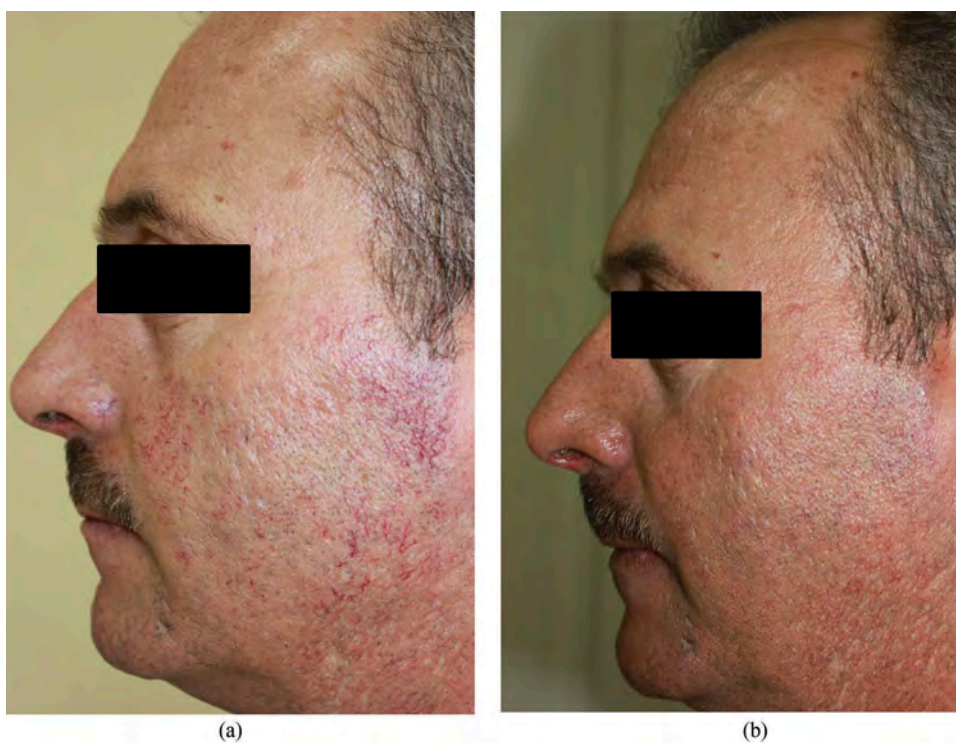


Figure 3. (a) A 46 year-old male with erythematotelangiectatic rosacea before the laser treatment. (b) The picture showing clinical improvement four weeks after the last treatment session.

efficacy of PDL and Nd-YAG on the treatment of rosacea, similar well -response rates and safety have been stated (11–13).

The positive effect of PDL on life quality in the rosacea patients has been demonstrated in the different studies (14–17). Tan et al. have reported a significant improvement in the

Table 3. Physicians' clinical assessment scale, patient's self-assessment scale, and data about the continuation of benefit at the follow-up period.

	n (%)
Physicians' clinical assessment	
No improvement (0%)	0 (0)
Mild (1–25%)	1 (7.1)
Moderate (26–50%)	4 (28.6)
Significant (51–75%)	7 (50)
Excellent (76–100%)	2 (14.3)
Patients' self-assessment	
No change or worsening	0 (0)
Poor improvement	1 (7.1)
Fair improvement	2 (14.3)
Good improvement	8 (57.1)
Excellent improvement	3 (21.4)
Continuation of benefit at the follow-up	
No benefit	0 (0)
Slight	2 (14.3)
Moderate	7 (50)
Significant	5 (35.7)

disease symptoms and life quality with PDL treatment (16). Menezes et al. have asked to complete the Dermatology Life Quality Index (DLQI) in 22 patients with rosacea and found statistically significant improvement in the DLQI scores after the PDL treatment (17). Recently, Strand et al. have stated that repeated sessions of PDL is correlated with the continuity of clinical benefit in addition to improvement in life qualities of the rosacea patients (9). In the current study, we found a statistically significant improvement in the erythema, telangiectasia, and life quality scores of the patients after the PDL treatment. Further, 85.7% of the patients reported the continuation of moderate or significant benefit of laser treatment at the follow-up period.

Side effects related to PDL treatment have been reported as generally transient and not serious. In the existing literature, erythema, edema, purpura, and pain have been reported quite common, whereas hyperpigmentation has been noted in a minority of the patients with PDL treatment (10–13). We have performed the PDL treatment safely in our patients with temporary side effects similar to the previous studies.

Although we found successful results with the PDL treatment, we had some limitations in the present study. The limitations were to include small number of patients and retrospective character of the study.

Consequently, our findings suggest that PDL treatment has high efficacy in the treatment of rosacea with a good safety profile. Moreover, our study emphasized the long-term benefit of PDL at the follow-up period and positive effect on life quality of the patients with rosacea. However, further studies should be conducted with a large sample size and design of randomized controlled trial by comparing different laser types and following the outcome for a long time.

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Declaration of interest

The authors report no conflict of interest.

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