




## ORIGINAL CONTRIBUTION

# The effect of 577-nm pro-yellow laser on demodex density in patients with rosacea

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## Abstract

**Background:** The pro-yellow laser is a yellow light wavelength (577-nm) laser system. Rosacea is a chronic inflammatory disorder that occurs with facial flushing, erythema, papules, pustules, and telangiectasia. Demodex parasites (*Demodex folliculorum* and *brevis*) also play a role in the pathogenesis of rosacea.

**Aim:** The aim of our study is to evaluate the effect of pro-yellow laser on demodex density (Dd) in patients with rosacea.

**Patients/Methods:** This retrospective study was planned for the patients with rosacea whose demodex mite densities were examined and treated with pro-yellow laser and were evaluated between 2019 and 2020 in the cosmetology unit. The laser light was applied at a dose of 20 J/cm<sup>2</sup> in the scanner mode (the 80% coverage) in all the patients. The demodex density per cm<sup>2</sup> was routinely evaluated before the treatment, and the demodex density values in the fourth week after the treatment were recorded from the patients' files.

**Results:** There were 27 females (79.4%) and seven males (20.6%) evaluated in the study. While the demodex density was 18.1 ± 10.7 (min: 0–max: 48, Q1:12–Q3:22) per cm<sup>2</sup> before the pro-yellow laser treatment in the cases, the demodex density was 10.2 ± 7.9 (min: 0–max: 30, Q1:4.75–Q3:12) per cm<sup>2</sup> in the fourth week after the treatment. After the pro-yellow laser treatment, the demodex intensity decreased significantly compared to before the laser treatment ( $p = 0.001$ ). There was no significant correlation between the decrease in the density of the demodex mite and the success of the treatment ( $p = 0.46$ ).

**Conclusion:** This is the first study in the literature investigating the change in demodex density in rosacea patients treated with pro-yellow laser therapy. In this study, it was shown that pro-yellow laser treatment is effective in reducing the density of demodex.

## KEYWORDS

demodex, laser treatment, pro-yellow laser, rosacea, standardized skin surface biopsy

## 1 | INTRODUCTION

The pro-yellow laser is a yellow light wavelength (577-nm) laser system. 577-nm is the ideal wavelength in the treatment of vascular lesions and vascular malformations on the skin.<sup>1</sup> The pro-yellow laser systems can be used in a wide range of indications such as facial erythema, facial telangiectasia, port wine stain nevus, rosacea, poikiloderma civatte, and Becker's nevus.<sup>2-4</sup> Some of these indications are clinical lesions in the vascular pattern; some are related to the factors that trigger vascularity, such as vascular endothelial growth factor (VEGF) in etiopathogenesis.<sup>1-4</sup>

Rosacea is a chronic inflammatory disorder that occurs with facial flushing, erythema, papules, pustules, and telangiectasia.<sup>5</sup> Demodex parasites (*Demodex folliculorum* and *brevis*) also play a role in the pathogenesis of rosacea. Demodex infestation is thought to cause stimulation of the cell-mediated immune response and the emergence of inflammatory lesions by breaking down the hair follicle wall.<sup>6</sup> One of the goals of rosacea treatment is to reduce the density of demodex mites.<sup>6,7</sup> The effect on the decreasing of the demodex mite density with pulse-dye laser (PDL) therapy in rosacea patients was evaluated in a study.<sup>7</sup> There is no study in the literature evaluating the effect of the pro-yellow laser treatment on the demodex mite density on the skin. The aim of this study is to evaluate the effect of pro-yellow laser on demodex density (Dd) in patients with rosacea.

## 2 | MATERIAL AND METHODS

This retrospective study was planned on the patients with rosacea whose demodex mite density was examined and treated with pro-yellow laser and was evaluated between 2019 and 2020 in the cosmetology unit. The patients included in the study were clinically diagnosed with rosacea. All clinical types of rosacea were included in the study. The exclusion criteria were pregnancy, active cutaneous infection, systemic chronic inflammatory diseases, photodermatoses and receiving the topical or systemic retinoid/steroid/antiparasitic/antibacterial treatment. Twenty-one patients were excluded from the study because they did not follow up or due to insufficient data. A total of 34 patients (27 females, seven males) who meet the conditions were evaluated. The study protocol was approved by the local ethics committee.

The skin was cleaned before the treatment session. Ocular protection was provided with laser glasses. The laser light was applied with a 577-nm pro-yellow laser (QuadroStar PRO YELLOW® Asclepion Laser Technologies). The laser light was applied at a dose of 20 J/cm<sup>2</sup> in the scanner mode (20 J/cm<sup>2</sup>, 42–46 ms, 1.5 s, the 80% coverage) in all patients. The demodex density per cm<sup>2</sup> was routinely evaluated before the treatment, and the density values were recorded in the fourth week after the treatment from the patients' files. The patients' age, gender, fitzpatrick skin type, and success of the treatment were also recorded from the patient files. The photographs taken with a digital camera before the treatment and 4 weeks



**FIGURE 1** The demodex mites under light microscope, the standardized skin surface biopsy (SSSB) with magnification (×40)

after the treatment were evaluated by the same dermatologist. The success of the treatment was evaluated with a visual analogue scale (VAS) in which 0 meant the minimum value and 100 meant the maximum value. A 5-item score was used to evaluate the improvement in the erythema as follows; "excellent" (90%–100%), "very good" (70%–89%), "good" (25%–69%), "slight" (1%–25%), and "ineffective" (0%). The side effects and scar formation status related to the pro-yellow laser treatment were evaluated from the control notes in their files and photographs of the fourth week after treatment.

### 2.1 | Sampling method: standardized skin surface biopsy (SSSB)

The SSSB is used to measure demodex density as a quantitative method. A standard area of 1 cm<sup>2</sup> was drawn on a microscope slide. A drop of cyanoacrylate adhesive was placed on the other side of the slide, and the sticky surface was applied to the cheek skin. After allowing the adhesive to dry (about 1 min), the slide was removed gently with surface skin. After removal from the skin, the slide was clarified with one drop of immersion oil (=cedar oil). The samples were studied microscopically at ×40 magnification (Figure 1). All the evaluations were conducted from the same region of the face (cheek), by the same dermatologist to reduce any mistakes in the techniques and microscopic inspections.

### 2.2 | Statistical analysis

The data were analyzed by using the SPSS 26.0 (SPSS Statistics 22.0, SPSS Inc., an IBM Company) statistical package program. The Kolmogorov–Smirnov test and histogram analyses were used to determine whether the variables were normally distributed. The normally distributed values were given as mean ± standard deviation, and the non-normally distributed values were given as both

**TABLE 1** Pre- and post-treatment results with SSSB of all study patients

Patient no	Age	Gender	Pre-laser Dd with SSSB	Post-laser Dd with SSSB	The change of Dd
1	42	Female	20	6	-14
2	34	Female	16	8	-8
3	47	Female	42	30	-12
4	46	Female	34	28	-6
5	33	Female	8	2	-6
6	32	Female	5	12	+7
7	23	Female	6	2	-4
8	54	Female	18	9	-9
9	42	Female	17	10	-7
10	54	Female	16	11	-5
11	38	Female	12	6	-6
12	44	Female	18	16	-2
13	40	Female	15	10	-5
14	39	Female	16	8	-8
15	30	Female	0	2	+2
16	48	Female	22	14	-8
17	57	Female	16	7	-9
18	44	Male	16	8	-8
19	56	Male	22	18	-4
20	40	Male	18	12	-6
21	51	Male	24	12	-12
22	32	Female	8	0	-8
23	38	Female	6	10	+4
24	49	Female	36	24	-12
25	60	Female	48	30	-18
26	37	Male	8	2	-6
27	44	Female	12	3	-9
28	60	Male	32	12	-20
29	37	Female	14	5	-9
30	42	Female	20	6	-14
31	45	Female	12	4	-8
32	40	Female	14	2	-12
33	43	Female	32	12	-20
34	35	Male	13	5	-8

Abbreviations: Dd, demodex density, SSSB, standardized skin surface biopsy.

mean  $\pm$  standard deviation and quartiles (Q1, Q3). The two dependent groups of nonparametric variables were compared using the Wilcoxon signed rank test. The Pearson's correlation analysis test was used. A  $p$  level of  $<0.05$  was accepted as statistically significant.

### 3 | RESULTS

There were 27 females (79.4%) and seven males (20.6%) evaluated in the study. The mean age of the patients was  $42.8 \pm 8.8$  (min-max, 23–60) years. The fitzpatrick skin type: 14 patients were of the

fitzpatrick skin type 2 (41.2%) and 20 patients were of the fitzpatrick skin type 3 (58.8%). In the evaluation made from the photographs of the patients, the success of the single-session pro-yellow laser treatment in terms of erythema was  $73.2 \pm 10.4\%$  (min-max, 50–90). The evaluating treatment success was excellent in three patients (8.8%), very good in 23 patients (67.6%), and good in eight patients (23.5%).

While the demodex density was  $18.1 \pm 10.7$  (min: 0–max: 48, Q1:12–Q3:22) per  $\text{cm}^2$  before the pro-yellow laser treatment in the cases, the demodex density was  $10.2 \pm 7.9$  (min: 0–max: 30, Q1:4.75–Q3:12) per  $\text{cm}^2$  in the fourth week after the treatment. After the pro-yellow laser treatment, the demodex intensity

decreased significantly when compared to before the laser treatment ( $p = 0.001$ ). The pre- and post-treatment results with the SSSB of all the participants are shown in Table 1. The effect of the pro-yellow laser on the demodex density before the treatment and after 4 weeks is shown in the histogram in Figure 2. After the pro-yellow laser treatment, the density of the demodex decreased in 31 patients, while the density of demodex increased in three patients. There was no significant correlation between the decrease in the density of the demodex mite and the regression of the erythema (treatment success) evaluated ( $p = 0.46$ ).

## 4 | DISCUSSION

This is the first study in the literature investigating the change in the demodex density in rosacea patients treated with pro-yellow laser therapy. In this study, it has been shown that pro-yellow laser treatment is effective in reducing the density of demodex.

The 577-nm pro-yellow laser has a yellow light wavelength with the important advantages of low pain level, high hemoglobin absorption, and low absorption of melanin and  $H_2O$ .<sup>1</sup> There are no side effects such as crusting, discoloration, or permanent scar tissue formation. Rarely, is erythema or irritation seen in treated patients.<sup>1,8</sup> There were no permanent irreversible side effects observed in our patients.

Rosacea, one of the most common indications in pro-yellow laser, is a chronic cutaneous disease which negatively affects the social life of patients and impairs their quality of life.<sup>9</sup> Human Demodex mites (*Demodex folliculorum* and *brevis*) are ectoparasites with a life cycle of 14–18 days, especially in the pilosebaceous unit of the facial skin and commensally in the eye lashes. Demodex mites are one of the factors blamed in the etiology of rosacea.<sup>5</sup> Reducing the density of demodex is one of the main goals in treatment.<sup>10</sup> However, the relationship between the demodex density and rosacea disease severity is not clear.<sup>11</sup> Similarly, in our study, there was no correlation between the reduction of demodex density and the treatment success.

There are various light and laser systems including PDL, and intense pulse light (IPL), KTP, and Nd: YAG are used for rosacea treatment.<sup>3,12</sup> In the literature, it was found that PDL treatment decreased the density of demodex in rosacea patients.<sup>7</sup> It was shown in a case report that Nd: YAG laser treatment decreased the demodex density.<sup>13</sup> In our study, we found a significant decrease in the demodex density in the rosacea patients with pro-yellow laser treatment; this finding was the first in the literature.

In the literature, it was found that IPL treatment in two patients increased the density of demodex mites in rosacea patients.<sup>14</sup> The reason for this increase is thought to be the increase of the demodex mites due to photosensitivity. In our three patients, an increase in the demodex density was found, but no clinical deterioration was observed.

## 5 | CONCLUSION

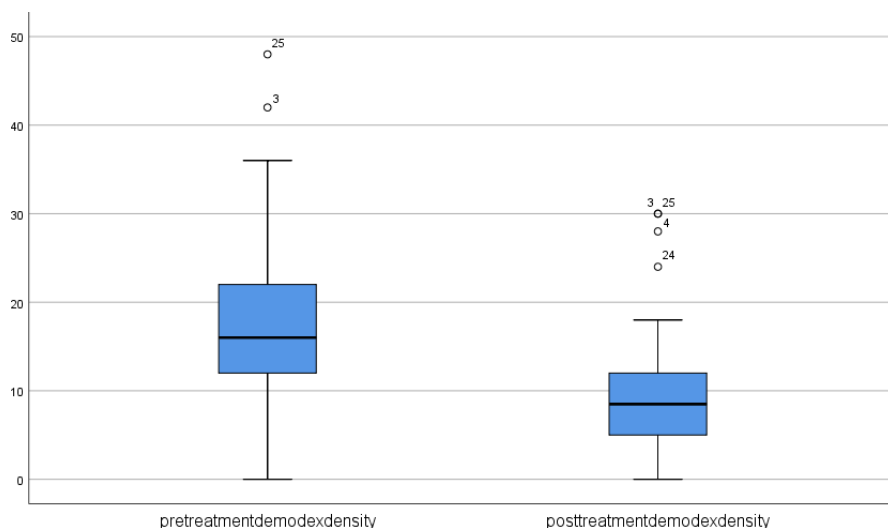
As a result, pro-yellow laser treatment reduced the density of demodex in the facial skin, which we can consider as a mechanism of its beneficial therapeutic effects. There was no correlation between the reduction of demodex density and clinical improvement, especially erythema. Our results support the idea that pro-yellow laser therapy is a good therapeutic alternative that can also be used as adjuvant therapy in the treatment of patients with demodicosis, which is resistant to other treatments.

### 5.1 | Limitations

The relatively small sample size and the absence of a control group can be seen as the limiting factor. However, it is not ethically possible to form a control group of healthy patients.

### CONFLICT OF INTEREST

None.



**FIGURE 2** The effect of pro-yellow laser on the demodex density before treatment and fourth weeks after the treatment

## AUTHORS' CONTRIBUTIONS

S.A.T, K.D., B.I., A.A., and R.D. performed the research. S.A.T, K.D., B.I., and R.D. designed the research study. S.A.T and B.I. contributed essential reagents or tools. S.A.T, K.D., and R.D. analyzed the data. S.A.T., K.D., A.A., and R.D. wrote the paper.

## ETHICAL APPROVAL

The study was approved by Local ethics committee of Necmettin Erbakan University, Meram Medical Faculty (date: 2020, number: 2356).

## DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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**How to cite this article:** Temiz SA, Durmaz K, Işık B, Ataseven A, Dursun R. The effect of 577-nm pro-yellow laser on demodex density in patients with rosacea. *J Cosmet Dermatol.* 2021;00:1-5. <https://doi.org/10.1111/jocd.14085>