Lasers in Medical Science (2019) 34:93–98
https://doi.org/10.1007/s10103-018-2606-6

ORIGINAL ARTICLE

Treatment of erythematotelangiectatic rosacea, facial erythema, and facial telangiectasia with a 577-nm pro-yellow laser: a case series

Yelda Kapicioglu[1] · Gulbahar Sarac[1] · Hulya Cenk[2]

Received: 16 April 2018 / Accepted: 31 July 2018 / Published online: 10 August 2018

Abstract

Various lasers have been used for the treatment of erythematotelangiectatic rosacea (ETR), facial erythema (FE), and facial telangiectasias (FT). The assessment of the treatments of all of these conditions with a 577-nm pro-yellow laser has not been reported yet. The aim of this work was to assess the efficacy and safety of the 577-nm pro-yellow laser in ETR, FE, and FT. Forty patients suffering from ETR, FE, and FT (25 female and 15 male) were enrolled in this study. All of the patients were treated with 577-nm pro-yellow laser (QuadroStarPRO YELLOW® Asclepion Laser Technologies, Germany) at 4-week intervals, for one to four sessions. The assessment of the treatment was made based on the digital photographs and the percentage of fading of the erythema and telangiectasias in the lesions. Significant clinical improvement (80–100%) was observed in the first or second sessions of the treatment in FE and ETR patients and in second and fourth sessions of the treatment in FT patients. The treatment was very well tolerated. No side effect was observed except for a few patients who had mild to moderate erythema fading away in 12–24 h. This case series has shown that the pro-yellow laser is a very effective, safe, and well-tolerated treatment for ETR, FE, and FT.

Keywords Treatment of rosacea · Laser treatment · Pro-yellow laser · Facial erythema

Introduction

Facial telangiectases (FT) are small-dilated vessels that are visible on the skin surface. They can vary in size (0.1–3 mm diameter), location, color (bluish to reddish), and pattern. Many patients have a genetic predisposition to facial telangiectases, while in others it is associated with various disorders, such as rosacea, connective tissue diseases, increased estrogenic states, liver disease, photodamage from sun exposure, prolonged steroid use, etc. They are a cosmetic disfigurement for millions of people, and since they are difficult to hide with makeup, cosmetic disfigurement is the most common presenting symptom [1, 2].

The pro-yellow laser, at 577 nm, has an ideal wavelength for treating cutaneous vascular disorders. Immediate blanching of the lesion is used as a clinical indicator of thermal damage and appropriate dose.

Various lasers have been used for the treatment of ETR, FE, and FT [3–5]. However, treatments of all of these conditions with a 577-nm pro-yellow laser have not been reported yet. The aim of this work was to assess the efficacy and safety of the 577-nm pro-yellow laser in ETR, FE, and FT.

Material–method

Patient selection

The study was conducted retrospectively. A total of 40 patients who were seen at our dermatology department with facial telangiectasia (FT), facial erythema (FE), and facial erythema-telangiectasia or erythematotelangiectatic rosacea (ETR) and then treated with the pro-yellow laser were retrospectively evaluated. The patients were diagnosed with a clinical examination and detailed history. No biopsy was taken from any patient for the diagnosis. The 40 patients consisted of 25 females and 15 males with a mean age of 38 (18–60) years. The skin type was Fitzpatrick II-III. Written consent

✉ Gulbahar Sarac
gulbaharsarac@gmail.com

[1] Department of Dermatology, Turgut Ozal Medical Center, Inonu University Faculty Of Medicine, Malatya, Turkey

[2] Department of Dermatology, Malatya Training and Research Hospital, Malatya, Turkey

was obtained from the patients and the study complied with the Helsinki Declaration.

Laser treatment

Topical anesthesia (2.5% lidocaine hydrochloride and 2.5% prilocaine [both *w*/*v*] [EMLA]; AstraZeneca, Södertalje, Sweden) was administered to the planned laser area approximately 30 min before the treatment. Cold application was used and the area was cleaned with octenidine dihydrochloride solution before the treatment. One to four sessions of pro-yellow laser applications at 577 nm were used for all patients with treatments taking place every 4 weeks. The first session was started with 22 J/cm^2 on average and the dose increased a mean value of 2 J/cm^2 at each session to a maximum of 28 J/cm^2. All sessions were started in the screening (form) mode. The spot mode of 6 mm was applied at the second and third sessions for FTs. The spot mode was started at 16 J/cm^2 and increased to a maximum of 22 J/cm^2. The procedure was followed by cold application for about 30 min. The patients were recommended to use sun protection cream regularly.

Evaluation of the patients

Digital photographs were taken of the areas with a lesion before and 4 weeks after the laser treatment and the results were evaluated by two different observers. The patient was accepted to have been cured if there was an improvement of 80% or more. The improvement rate of erythema and telangiectasia was considered to be the criteria for improvement and all the patients were observed for any scatris formation, postinflammatory hyperpigmentation, and hypopigmentation development as possible complications in the treated parts of the face.

Statistical evaluation

The SPSS for Windows Version 22.0 software was used for the statistical evaluation of the study data. Mean (X) ± standard deviation (SD) was used for the data regarding quantitative variables and number (*n*) and percentage (%) for qualitative data. Statistical evaluation of the data was conducted with the Pearson chi-square test and Fisher's exact chi-square test. A p value < 0.05 was accepted as statistically significant.

Results

A total of 40 patients were included in the study. The demographic characteristics revealed that there were 25 females (62.5%) and 15 males (37.5%) with a mean age of 38.7 ± 9.9 (18–60 years). Skin type evaluation revealed 15 Fitzpatrick II and 25 Fitzpatrick III patients.

The diagnosis was FE in 13 patients, FT in 11 patients, ETR in 7 patients, and facial erythema + facial telangiectasia in 9 patients. The success rate with the laser was highest in patients with facial erythema but lower in the FT patients than the others. Besides, the mean number of laser sessions was also lower in facial erythema. The patient distribution and success rate based on the sessions are presented in Table 1.

Pre- and posttreatment pictures of the FE (Fig. 1), FT + FE (Fig. 2), and ETR (Fig. 3) patients have been presented.

Skin type evaluation revealed 15 Fitzpatrick II and 25 Fitzpatrick III patients. The success rate of laser treatment in terms of skin type was 92% for Fitzpatrick II and 87% for Fitzpatrick III and is presented in Table 2.

Evaluation of lesion location by gender showed no statistically significant difference for the forehead and cheek areas ($p = 0.722$, $p = 1.00$, respectively) but the rate of nasal involvement was statistically significantly higher in males than females ($p = 0.008$). Table 3 presents nasal area involvement rates by gender.

Chin area involvement was also statistically significantly higher in males ($p = 0.007$). Table 4 Presents chin involvement rates by gender.

Evaluation of the facial area affected by disease type showed statistically significantly higher forehead area involvement in ETR than in the other disorders ($p = 0.006$). The cheek area was the most commonly affected area in all four disorders at 100% of FE patients, 72.7% of FT patients, 100% of ETR patients, and 100% of FE + FT patients).

The highest ratio of nasal involvement was in the FT patients and Table 5 presents the nasal involvement rates based on disease type.

The chin involvement rate was highest in ETR and there was no patient with chin involvement in FT. The chin involvement rate was 38.5% in FE, 0% in FT, 57.1% in ETR, and 44.4% in FE + FT.

There was no statistically significant difference in terms of forehead, cheek, and chin involvement according to skin type ($p = 0.091$, $p = 1.0$, $p = 0.433$, respectively) but nasal

Table 1 The patient distribution and success rate

Disorder type	Success rate (%)	Number of mean session	Success rate after 1st session (%)	Success rate after 2nd session (%)	Success rate after 3rd session (%)	Success rate after 4th session (%)
FE	95.38	1.53	87.6	95.0	100.0	
FT	83.63	3.36	66.3	73.7	86.0	100
ETR	91.42	3.14	71.4	81.4	91.4	
FE + FT	85.5	2.22	76.6	82.5	90.6	93.3

Fig. 1 Patient with FE is recovering after two sessions

involvement was statistically significantly more common in patients with the Fitzpatrick II skin type compared to Fitzpatrick III ($p = 0.008$).

There were no any complications of laser treatment such as atrophic scatris formation, postinflammatory hyperpigmentation, and hypopigmentation in the patients except a mild erythema persisting approximately 60 min after the treatment.

Discussion

FT lesions vascular structures that appear in various sizes, colors (purple, red, pink), and shapes (linear, arborizing, random) at various locations. Although etiological factors include rosacea, systemic or topical corticosteroid use, and connective tissue disorders, most cases are idiopathic. They usually develop due to genetic factors and sun exposure during

Fig. 2 Healing of the patient with FE + FT at the end of the third session

Fig. 3 Improvement of ETR patient after the fourth session

childhood and in patients with Fitzpatrick I or II skin types [1]. FE and ETR are thought to develop following a pathological vasomotor reaction due to various stimulants. Although topical oxymetazoline and brimonidine can be used for treatment, these agents can cause rebound erythema and laser treatment is preferred [6]. These disorders affect millions of people worldwide both physically and psychologically and their treatment has been an important issue in dermatology. Recent technological advances in the field of lasers have enabled better results and lower complication rates than the other treatment methods, significantly improving treatment options [7].

The main chromophore in facial telangiectasia and facial erythema is hemoglobin. Hemoglobin absorption has two main peak points at 542 nm and 577 nm in visible light. Various laser systems (Argon laser, Krypton lasers, Potassium-titanyl-phosphate (KTP) lasers, pulsed dye lasers, etc.) have been reported to be effective in the treatment of facial telangiectasia and erythema [8]. However, some of these have caused significant side effects following FT or FE treatment. For example, hypopigmentation and pitted-depressed scars have been reported after the Argon laser [9], bullae, crusts, periorbital erythema, edema, and posttreatment hyperpigmentation after the Krypton laser, and bruising, erythema, hyperpigmentation, and atrophic scars after PDL treatment [10, 11]. An attempt is being made to minimize these laser adverse effects with technological advances.

The recent pro-yellow laser only has a yellow light wavelength. The light energy is 100% 577 nm yellow light. This wavelength is ideal for vascular lesions. The copper bromide laser has the closest wavelength to the pro-yellow laser but contains two wavelengths with 90% yellow light and 10%

Table 2 Success rate according to sessions according to skin type

Skin type	Success (%)	Average session	Success rate after 1st session (%)	Success rate after 2nd session (%)	Success rate after 3rd session (%)	Success rate after 4th session (%)
Fitzpatrick II	92	2.06	80.6	83.3	98.3	100
Fitzpatrick III	87.6	2.28	74.0	82.0	86.0	90

Table 3 Nasal involvement by gender

Gender	Nose involvement (−) (*n*)	Nose involvement (+) (*n*)	Total (*n*)
Female	14 (% 56)	11(% 44)	25
Male	2 (% 13.3)	13 (% 86.7)	15

green light [4]. However, the green light of the copper bromide laser has been associated with adverse effects and is thought to be the main factor in the low success rate in patients with dark skin color and resultant post-inflammatory hyperpigmentation. The fact that the pro-yellow laser only has yellow light wavelength presents several advantages in the treatment of vascular lesions such as the possibility of use in patients with dark skin, minimal risk for hyperpigmentation or scar development, and short duration of posttreatment erythema.

We did not come across any other report in the literature on the use of the pro-yellow laser for facial vascular lesions. There are reports of the successful use of the copper bromide laser, which has the closest wavelength to pro-yellow, in FT treatment. Owen et al. [2] divided facial telangiectasia lesions into three groups according to size in the study they conducted with the copper bromide laser. Fine telangiectasia in the cheek area and thick telangiectasia in the nose area were found to be resistant to the treatment. The size, location, and depth of the vascular structure and the blood flow rate were factors influencing the success of the laser treatment. Another study with the copper bromide laser reported the location of the vascular lesions to affect the response to treatment. The success rate was lower in lesions located in the nasal area and vascular lesions thicker than 300 nm, requiring a larger number of sessions. Erythema and edema continuing for about 48 h developed in the eyelid and neck area [1]. Another disadvantage of copper bromide laser systems is that the equipment system is very big and heavy [12].

We found a higher rate success with a smaller number of sessions when treating facial erythema in our study while the facial telangiectasia group was the most resistant to treatment. We found no significant treatment-related adverse effects. A mild erythema continuing for approximately 60 min after the sessions was the most common adverse effect and did not cause loss of work or prevent social activities in any of the patients. We had no patient discontinuing the treatment due to adverse effects. However, we did not classify the vascular structures by size.

Table 4 Chin involvement by gender

Gender	Chin involvement (−) (*n*)	Chin involvement (+) (*n*)	Total (*n*)
Female	13 (% 52)	12(% 48)	25
Male	14 (% 93.3)	1(% 6.7)	15

Table 5 The nasal involvement rates based on disease type

Disorder type	Nose involvement (−) (*n*)	Nose involvement (+) (*n*)	Total (*n*)
FE	8 (% 61.5)	5 (% 38.5)	13 (% 100)
FT	1 (% 9.1)	10 (% 90.9)	11 (% 100)
ETR	3 (% 42.9)	4 (% 57.1)	7 (% 100)
FE + FT	4 (% 44.4)	5 (% 55.6)	9(% 100)

Other laser systems effective in the treatment of vascular lesions are the pulsed dye laser and the intense-pulsed light (IPL) system. However, erythema, purpura, edema, and serous crusting continuing for about 10 days can be observed with the pulsed dye laser. These adverse effects are usually not acceptable for the patients. Hypopigmentation and hyperpigmentation are other common side effects, especially in individuals with dark skin [13]. Besides good results with IPL, there are some disadvantages also such as the large spot width decreasing the opportunity to use in small lesions and the lack of simultaneous observation of the treated area as contact cooling systems are required for epidermal protection [14].

Many other types of laser have been used for the treatment of facial erythema and facial telangiectasia and reported to be effective. However, the cost and ergonomics of the laser device are also important. The pro-yellow laser does not require the dye used in pulsed dye laser systems or the gel used in IPL laser systems. It also does not require a large and heavy system as for the copper bromide laser or a cooling apparatus as in the IPL laser system.

In conclusion, we believe that the pro-yellow laser, with the advantages of a high success rate with a low number of sessions and mild or no adverse effects is an effective alternative in the treatment of FE, ETR, and FT. Our findings need to be supported with studies on a larger series of patients.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical approval The study has been conducted retrospectively. All procedures performed in this study on human participants were in accordance with the 1964 Helsinki Declaration, and its later amendments.

Informed consent Informed consent was obtained from all the patients included in the study.

References

1. McCoy SE (1997) Copper bromide laser treatment of facial telangiectasia: results of patients treated over five years. Lasers Surg Med 21(4):329–340

2. Owen WR, Hoppe E (2012) Copper bromide laser for facial telangiectasia: a dose response evaluation. Australas J Dermatol 53(4): 281–284
3. Alam M, Voravutinon N, Warycha M, Whiting D, Nodzenski M, Yoo S, West DP, Veledar E, Poon E (2013) Comparative effectiveness of nonpurpuragenic 595-nm pulsed dye laser and microsecond 1064-nm neodymium:yttrium-aluminum-garnet laser for treatment of diffuse facial erythema: A double-blind randomized controlled trial. J Am Acad Dermatol 69(3):438–443
4. Laube S, Lanigan SW (2002) Laser treatment of rosacea. J Cosmet Dermatol 1(4):188–195
5. Micali G, Gerber PA, Lacarrubba F, Schäfer G (2016) Improving Treatment of Erythematotelangiectatic Rosacea with Laser and/or Topical Therapy Through Enhanced Discrimination of its Clinical Features. J Clin Aesthet Dermatol. 9(7):30–39
6. Handler MZ, Bloom BS, Goldberg DJ (2017) IPL vs PDL in treatment of facial erythema: A split- face study. J Cosmet Dermatol 16(4):450–453
7. Hare McCoppin HH, Goldberg DJ (2010) Laser treatment of facial telangiectases: an update. Dermatol Surg 36(8):1221–1230
8. Yoo KH, Kim BJ, Kim MN (2009) Efficacy of high-energy copper bromide laser (511 and 578 nm) with for deep infantile haemangioma. Clin Exp Dermatol 34(7):e451–e452
9. Remington BK (1983) Argon laser therapy – rosacea, telangiectasia. J Dermatol Surg Oncol 9:424
10. Thibault PK (1997) A patient's questionnaire evaluation of krypton laser treatment of facial telangiectases. A comparison with the copper vapor laser. Dermatol Surg 23(1):37–41
11. Clark SM, Lanigan SW, Marks R (2002) Laser treatment of erythema and telangiectasia associated with rosacea. Lasers Med Sci 17: 26–33
12. Lee S, Lee T, Kim H, Kim J, Eun H, Kim R (2013) A practical comparison of Copper Bromide Laser for the treatment of vascular lesions. Conf Proc IEEE Eng Med Biol Soc 2013:3765–3768
13. Gao L, Gao N, Song W, Dang E, Yin R, Wang L, Wang G (2017) A Retrospective Study on Efficacy of Pulsed Dye Laser and Intense Pulsed Light for the Treatment of Facial Telangiectasia. J Drugs Dermatol 16(11):1112–1116
14. Ting PT, Rao J (2011) Vascular lesions. Curr Probl Dermatol 42: 67–80