European Journal of Therapeutics https://doi.org/10.58600/eurjther-346

Original Research

An Investigation of the Effectiveness of the 577-nm Pro-yellow Laser in Patients with Vascular Disorders

Arzu Ataseven[1], Selami Aykut Temiz[1], İlkay Özer[1]

1 Necmettin Erbakan University Meram Medical Faculty, Department of Dermatology, Konya, Turkey

ABSTRACT

Background: Vascular disorders severely impair the psycho-social status of individuals. Various laser and light systems, which have advantages and disadvantages, including the pro-yellow laser are used for the therapy of these disorders.

Aim: The goal of the present study was to investigate the effectiveness and feasibility of the 577 nm pro-yellow laser for a broad range of indications including erythematelangiectatic rosacea, facial erythema, post-acne erythema, facial telangiectasis, hemangioma, genital angiokeratoma, and port wine stain nevus.

Methods: A total of 98 patients (25 male, 73 female) older than 15 years who were treated with the pro-yellow laser for vascular disorders at the cosmetology unit between 2017 and 2019 were retrospectively included in the study.

Results: The mean rate of recovery was 100% in genital angiokeratoma, 94.4% in spider angioma, 83.3% in facial telangiectasis, 74.8% in erythematotelangiectatic rosacea, 72% in facial erythema + facial telangiectasis, and 68.3% in facial erythema. Over 60% of improvement was observed in most patients with vascular disorders. There was no significant link between the Fitzpatrick skin type and treatment success. Treatment success was significantly low in cases with nasal involvement.

Conclusion: The current study concluded that pro-yellow laser is an efficient and safe laser modality that may yield satisfactory outcomes regardless of the different skin types.

Keywords: Pro-yellow laser, vascular disorders, laser treatment, vascular laser

INTRODUCTION

Vascular disorders affecting the skin, particularly the rosacea, facial telangiectasia, facial erythema, port-wine stain nevus, and many others influence negatively the psychological status of individuals, these vascular skin problems are more common in women (1). Light systems were first used for the therapy of cutaneous vascular disorders by Goldman et al. in the 1960s (2). Many laser systems including Nd:YAG lasers (1064 nm), KTP-lasers (532 nm), pulsed dye lasers (585 and 595 nm), intense pulsed light (IPL), alexandrite lasers (755 nm), and diode lasers (800–900 nm) continue to be utilized today (3). The pro-yellow (577 nm) laser has recently been introduced as an alternative (4,5).

In vascular lesions, the goal chromophore is mostly oxyhemoglobin followed by deoxyhemoglobin and methemoglobin. The energy is first transferred to the target chromophore oxyhemoglobin, the warmth is transferred to the vascular wall and ultimately the vascular wall is injured. Absorption peaks of oxyhemoglobin are in the green and yellow light spectrum, the wavelengths are 410-429, 541,577 nm, and 700 and 1200 nm (4).

The goal of the present study was to investigate the usefulness and feasibility of pro-yellow laser for a broad range of indications including erythematotelangiectatic rosacea, facial erythema, facial telangiectasia, post-acne erythema, hemangioma, spider angioma, genital angiokeratoma, and port-wine stain nevus.

METHODS

98 patients older than 15 years that were treated with the pro-yellow laser for vascular disorders at the cosmetology unit between 2017 and 2019 were retrospectively included in the study. Ten patients were excluded because they were lost to follow-up or due to missing information. A total of 98 patients (25 male, 73 female) were evaluated.

Diagnoses included facial erythema, facial telangiectasia, erythematotelangiectatic rosacea, post-acne erythema, facial erythema + facial telangiectasia, hemangioma, spider angioma, genital angiokeratoma, and port-wine stain nevus. Data about the anamnesis of the patients, the lesion locations, the pro-yellow laser application doses, the duration of treatment, comorbidities, and the other dermo-cosmetic procedures and treatments were obtained from patient files. Exclusion criteria were active cutaneous infection, pregnancy, photodermatoses, and systemic or local retinoid treatment.

How to cite: Ataseven A, Temiz SA, Özer I. An Investigation of the Effectiveness of the 577-nm Pro-yellow Laser in Patients with Vascular Disorders. Eur J Ther. 2023;29(1):49-54. https://doi.org/10.58600/eurjther-346

Corresponding Author: Selami Aykut Temiz **E-mail:** aykutmd42@gmail.com

Received: 28.03.2022 • **Accepted:** 04.05.2023

Figure 1. Post acne erythema, pre and post treatment

Figure 2. Immediately after the procedure of a single session in a patient with erythematelangiectatic rosacea, pre and post treatment

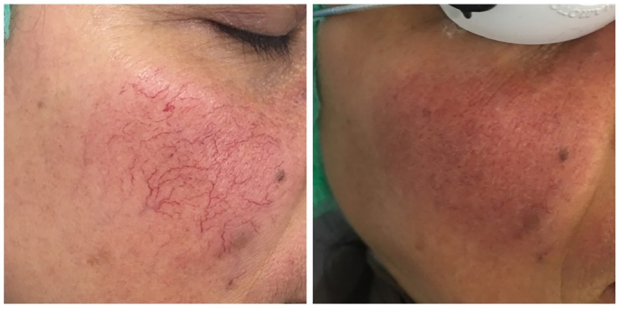


Figure 3. Port-wine stain nevus, pre and post treatment

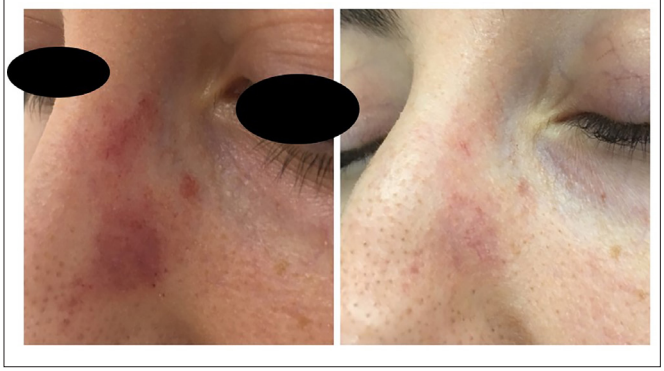
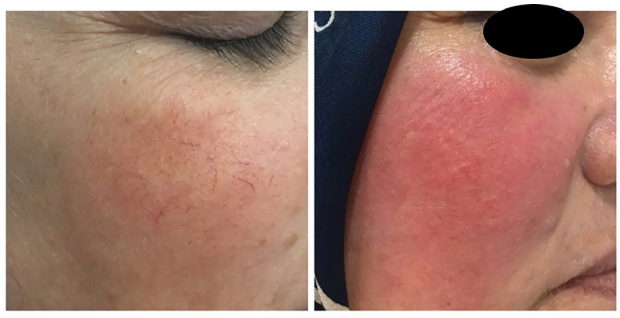


Figure 4. Erythema immediately after the procedure in a patient with facial telangiectasis



Before the treatment, the skin was cleaned and made readied. The therapy was performed with a 577-nm pro-yellow laser (Asclepion Laser Technologies QuadroStar PRO YELLOW®) using a wavelength of 577-nm. The therapy was ordered at four-week intervals. The first session was begun with 20j/cm^2, and the dosage enhanced an average value of 2j/cm^2 at each session. The dose was elevated up to 26j/cm^2. If the lesion had telangiectasia, the basic mode was used first. The scanner mode was used if the lesion did not include telangiectasia, or it was larger than 0.5 cm. A cold implementation was applied and/or a topical steroid was done if the patient had a burning sensation or erythema after the procedure. Sunscreen was applied after the procedure in all patients. All patients were photographed before and after the procedure.

Main Points:

- The study is the first in the literature to investigate the pro-yellow laser effectively used for the therapy of vascular disorders in the highest number of patients and the largest indication spectrum.
- In the study, nasal involvement was observed more in males, and in addition to the current literature, treatment success was significantly lower in cases with nasal involvement.
- The study concluded that pro-yellow laser is an influential and safe laser modality that may yield satisfactory outcomes regardless of the different skin types.

The evaluation of the therapy relied on clinical examination and standardized digital photographs using a camera at baseline and after the treatment sessions. Treatment success of patients was evaluated by using a visual analog scale (VAS) that 0 indicated the minimum value, and 100 indicated the maximum value. Improvement was rated by the same dermatologist as follows: "excellent" (90%-100%), "very good" (70%-89%), "good" (25%-69%), "slight" (1%-25%), and "ineffective" (0%). In the monthly follow-up, the adverse effects that had developed in the patients were recorded in their files.

Ethics Approval

Ethics approval: All the procedures followed the Helsinki declaration and the Necmettin Erbakan University Meram Faculty of Medicine local ethics committee approval was received for the study (Decision date and number: 2019/2036).

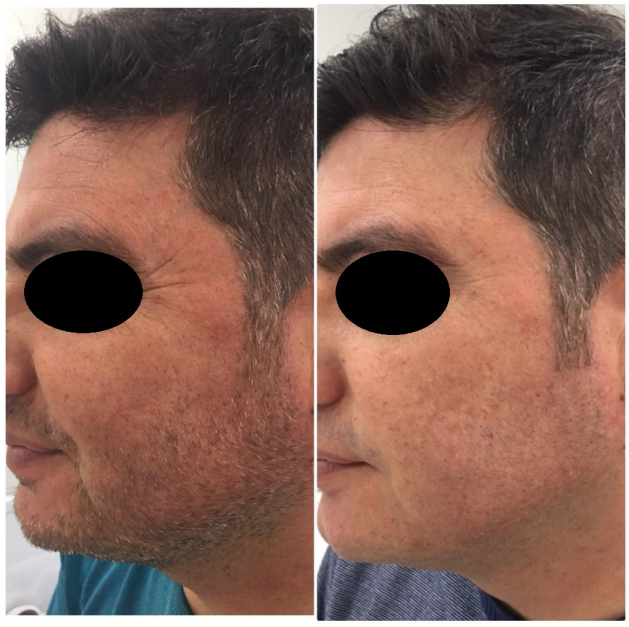
Statical Analysis

Data were investigated by using the SPSS 22.0 (SPSS Inc., an IBM Company, Chicago, IL, USA) statistical software. The normality distribution of the variables was evaluated with one sample Kolmogorov Smirnov test. Variables that showed normal distribution were shown as mean and standard deviations (mean ± SD). Oneway ANOVA, student t, and chi-square tests were used for statistical analyses. Written and oral informed consent form was received from all patients prior to the study.

Table 1. The distribution of the patients according to gender and indications

Disorder type	Female	Male	Total
Facial erythema	8	1	9
Facial telangiectasias	18	9	27
Erythematotelangiectatic rosacea	24	7	31
Postacne erythema	3	1	4
Facial erythema + Facial telangiectasias	6	2	8
Hemangioma	2	2	4
Spider Angioma	8	1	9
Genital angiokeratoma	2	0	2
Port-wine stain	2	2	4
	73	25	98

Figure 5. Facial erythema, pre and post treatment



RESULTS

A total of 98 patients (73 females and 25 males) were investigated in the study. The dispersion of the patients according to gender and indications is presented in Table 1. The distribution of the patients according to age, gender, skin type, and number of sessions is presented in Table 2.

The ratio of excellent and very good outcomes were as follows: 66.6% for facial erythema, 96.3% for facial telangiectasia, 83.9% for erythematotelangiectatic rosacea, 100% for post-acne erythema, 62.5% for facial erythema + facial telangiectasia, 100% for hemangioma, 100% for spider angioma, 100% for genital angiokeratoma, and 25% for port-wine stain nevus. Age, gender, skin type, and number of sessions are presented in Table 3.

We observed higher than 60% success in the vast majority of the cases. The mean success rates and the number of sessions are presented in Table 4.

Table 2. The characteristics of the patients

	Facial erythema (n=9)	Facial telangiectasias (n=27)	Erythemato-telangiectaticro-sacea (n=31)	Postacne erythema (n=4)	Facial erythema + Facial tel-angiectasias (n=8)	Hemangi-oma (n=4)	Spider Angioma (n=9)	Port-wine stain (n=4)
Age/years Range (Mean±SD)	15–39 (30.3±9.1)	8–70 (31.2±15.4)	23–56 (40.9±8.2)	16–27 (22.3±5.2)	37–60 (43.6±7.2)	18–48 (32.7±13.7)	9–59 (27.2±17)	14–19 (16.5±2)
Gender, n (%)								
Female	8 (88.9)	18 (66.7)	24 (77.4)	3 (75)	6 (75)	2 (50)	8 (88.9)	2 (50)
Male	1 (11.1)	9 (33.3)	7 (22.6)	1 (25)	2 (25)	2 (50)	1 (11.1)	2 (50)
Skin type, n (%)								
II	6 (66.9)	13 (48.2)	12 (38.7)		5 (62.5)	2 (50)	1 (11.1)	1 (25)
III	3 (33.3)	11 (40.7)	18 (58.1)	4 (100)	3 (37.5)	2 (50)	8 (88.9)	2 (50)
IV		3 (11.1)	1 (3.2)					1 (25)
Number of sessions Mean±SD	2±0.7	1.7±0.9	2.7±0.9	1.75±1	3.1±1	3.2±0.9	1.4±0.7	3.75±0.5

Table 3. The success according to disorder type

Disorder type,n (%)	Excellent	Very good	Good
Facial erythema		6 (66.6)	3 (33.3)
Facial telangiectasias	14 (51.9)	12 (44.4)	1 (3.7)
Erythematotelangiectatic rosacea	1 (3.2)	25 (80.7)	5 (16.1)
Postacne erythema		4 (100)	
Facial erythema + Facial telangiectasias	2 (25)	3 (37.5)	3 (37.5)
Hemangioma	1 (25)	3 (75)	
Spider Angioma	9 (100)		
Genital angiokeratoma	2 (100)		
Port-wine stain		1 (25)	3 (75)

Table 4. The success rate according to disorder type

Disordertype	The mean success rate (%)	Average session
Facial erythema	68.3	2
Facial telangiectasias	83.3	1.7
Erythematotelangiectatic rosacea	74.8	2.7
Postacne erythema	78.7	1.7
Facial erythema + Facial telangiectasias	72	3.1
Hemangioma	80	3.2
Spider Angioma	94.4	1.4
Genital angiokeratoma	100	2
Port-wine stain	65	3.7

Table 6. The relationship of nasal involvement with gender and treatment success

	Nasal involvement (-)	Nasal involvement (+)	p value
The mean success rate (%)	81.8	74.3	**0.01**
Average session	2.14	2.54	0.26
Female	47	26	**0.03**
Male	10	15	

The patient skin types were mostly skin type II and III of Fitzpatrick's. There was no significant link between Fitzpatrick's skin type and treatment success (p=0.64). The success rate according to skin types is presented in Table 5.

The nasal involvement was higher in the males, and the number of sessions was higher in patients with nasal involvement but with no statistical difference. Treatment success was significantly low in cases with nasal involvement (p=0.01). The relationship of nasal involvement to gender and treatment success is shown in Table 6.

Images of the patients before and after pro-yellow laser in different indications may be seen in Figures 1-5. We observed temporary erythema that regressed maximum within one to two days maximum after the procedure in a small number of patients (Figure 4). No patient had any permanent adverse effects.

DISCUSSION

This is the first study in the literature to investigate the pro-yellow laser effectively used for the therapy of vascular disorders in the highest number of patients and the largest indication spectrum. Two studies are available in the literature that investigates the effectiveness of the pro-yellow laser in a smaller number of patients and indications (5,6). Kapicioglu et al. reported 80-100% improvement in a total of 40 patients with erythematotelangiectatic rosacea, facial erythema, and facial telangiectasia (5). Mohamed et al. investigated the effectiveness of the pro-yellow laser in 95 patients with port-wine stain nevus, papulopustular rosacea, facial telangiectasia, and facial erythema and observed a significant healing in more than 50% of the patients (6). Our study included a total of 98 patients with a larger indication including facial erythema, facial telangiectasis, erythematotelangiectatic rosacea, post-acne erythema, facial erythema + facial telangiectasia, hemangioma, spider angioma, genital angiokeratoma, and port-wine stain nevus. We observed significant improvement, greater than 60%, in our study.

In the literature, no significant link has been found between Fitzpatrick's skin type and treatment success (5,6). Similar to the literature, the achievement of treatment in terms of skin type was not significantly different in our study. In the study by Kapıcıoğlu et al., nasal involvement was found more in men (5). In our study, nasal involvement was observed more in males, and in addition to the literature, treatment success was significantly lower in cases with nasal involvement.

Pulsed dye laser, one of the lasers used for the treatment of vascular disorders, has been shown to be effective in various studies;

Table 5. The success rate according to skin types

	Fitzpatrick skin type II	Fitzpatrick skin type III	Fitzpatrick skin type IV	p value
Number of the patients	40	51	7	**<0.001**
The mean success rate (%)	78.1	78.4	82.9	0.64
Average session	2.4	2.3	2	0.63

however, it has some disadvantages in addition to the necessity of needing dye including leading to hypo/hyperpigmentation, scarring, post-laser effect-related purpura, and discoloration of the lesion (7,8,9). The KTP laser produces green light at a wavelength of 532 nm and does not lead to post-operative purpura, a reason that KTP is superior to PDL. The main disadvantage of KTP is the higher absorption of energy by the epidermal melanin with a higher risk of pigmentary changes, especially in darker or tanned skin types. Near-infrared lasers (700-1200 nm), diode lasers (800–900 nm), alexandrite lasers (755 nm), and Nd:YAG lasers (1064 nm) have deeper penetration with lower absorption by the melanin, so it is safe for all skin types. However, higher joules may be required for real photocoagulation due to low hemoglobin absorption and high water absorption. This is a disadvantage because it means more pain. Intense pulsed light (IPL) is a large band light between 500 to 1200 nm. This large band range allows a different depth of oxyhemoglobin absorption; however, adverse effects like post-inflammatory hyperpigmentation, bullae, and crust may be observed particularly, in dark individuals, as the light may be absorbed easily by the melanin (10). The pro-yellow (577 nm) laser has a yellow light wavelength with the substantial advantages of high hemoglobin absorption, low absorption of melanin, low water absorption, and a low pain level. It also has real photocoagulation. The 577 nm pro-yellow laser can see the lesions 40% better than the KTP and 70% better than the 585 nm PDL (4). No adverse effects such as discoloration, crusting, or permanent scar formation happen, and irritation or erythema are rare. We did not detect any adverse effects other than mild irritation in dry-sensitive skin, temporal erythema, and mild pain in high joules. No persistent irreversible adverse effects emerged in our patients.

Although the exact cause of facial erythema and telangiectasia is not known, genetic factors, having the Fitzpatrick skin type I-II, topical or oral corticosteroid use, sun exposure in childhood, and rosacea are usually blamed (11). These are reported to be important cosmetic problems by the patients and are effectively treated with laser and light systems (4,9,10,12). Effectiveness and adverse effects were found to be equal in a study in which PDL was applied to one side of the face and IPL to the other (13). In a study comparing 532 nm and 940 nm, no difference was found with regard to effectiveness; however, 940 nm was found to have fewer adverse effects like erythema, crusting, swelling, bullae, and pain (14). In our study, we found good effectiveness in more than 60% of the patients with facial erythema, telangiectasia or facial erythema + telangiectasia although mild erythema and crusting were noticed by a small number of patients. Uebelhoer et al. applied KTP to one side of the face and PDL to the other. In their study conducted with the patients with telangiectasia and erythema, KTP was found to be more effective although it led to more adverse effects, Complete clearance was found to be 85% in the third session with KTP and 75% with PDL (12).

The pro-yellow laser was used for the first time in the literature in the treatment of post-acne erythema by Saraç et al. in 40 patients, and a success rate of 76-100% was reported (15). In our study, nearly 70% treatment success was found in facial erythema.

Rosacea is a common skin disease that negatively affects the social life of the patients and reduces the quality of life by leading to anxiety and depression (16). Medical treatment is usually insufficient in erythematotelangiectatic rosacea. Various light and laser systems including IPL, PDL, KTP, and Nd:YAG are utilized for therapy. Various success rates have been reported in various studies (7,17). We have observed good improvement in more than 80% of rosacea patients; however, we have observed erythema lasting for a maximum of one to two days in some of the patients with a sensitive skin type (Figure 4). Overall, we did not encounter any adverse effects other than mild pain and temporal erythema with 24-26 joules and above screening mode or 16 joules or above with a pencil probe. We consider its low adverse effect profile as an advantage of the pro-yellow laser.

CONCLUSION

The pro-yellow laser is a very influential method for the treatment of vascular disorders. This is the first study to investigate pro-yellow laser in a large patient group and with a wide spectrum of diseases including facial erythema, facial telangiectasia, erythematotelangiectatic rosacea, post-acne erythema, facial erythema + facial telangiectasia, hemangioma, spider angioma, genital angiokeratoma, and port-wine stain nevus. We consider that the 577 nm pro-yellow laser is a useful treatment choice with pleasing outcomes for both patients and physicians in the treatment of vascular lesions or other vascular-based lesions.

Limitations: The limitations of the study were the retrospective nature and the imbalance in the female/male ratio.

Funding: No funding

Competing interest for all authors: The authors declare that they have no relevant conflict of interest.

Author's contributions: A.A., S.A.T: researched the literature, wrote the article, A.A.,S.A.T.,İ.Ö: critised and edited the paper.

Ethics approval: All the procedures followed the Helsinki declaration and the Necmettin Erbakan University Meram Faculty of Medicine local ethics committee approval was received for the study (Decision date and number: 2019/2036).

REFERENCES

1- Alinia H, Cardwell LA, Tuchayi SM, Nadkarni A, Bahrami N, Richardson IM, et al. Screening for depression in rosacea patients. Cutis 2018;102:36-38.
2- Goldman L, Blaney DJ, Kindel Jr, Franke EK. Effect of the laser beam on the skin. Preliminary report. J Invest Dermatol 1963;40:121-2.
3- Tanzi EL, Lupton JR, Alster TS. Lasers in dermatology: four decades of progress. J Am Acad Dermatol 2003;49:1-31.
4- Temiz SA, Ataseven A, Dursun R, Özer İ. Successful treatment of poikiloderma of Civatte with a 577-nm pro-yellow laser. Journal of Cosmetic Dermatology, 2020;19(10):2769-2770.
5- Kapicioglu Y, Sarac G, Cenk H. Treatment of erythematotelangiectatic rosacea, facial erythema, and facial telangiectasia with a 577-nm pro-yellow laser: a case series. Lasers Med Sci 2019;34:93-98.

6- Mohamed EM, Mohamed Tawfik K, Hassan Ahmad W. Successful treatment of facial vascular skin diseases with a 577-nm pro-yellow laser. J CosmetDermatol2019;18(6):1675-1679.
7- Strand M, Bergqvist G, Griffith S, Bergqvist E. The effect of recurrent pulsed dye laser treatments in rosacea patients. J Cosmet Laser Ther 2017;19:160-164.
8- Kwon SH, Choi JW, Byun SY, Kim BR, Park KC, Youn SW, et al. Effect of early long-pulse pulsed dye laser treatment in infantile hemangiomas. Dermatol Surg 2014;40(4):405-11.
9- Nam CH, Kim MH, Hong SP, Park BC. Fractional 532-nm KTP diode laser and 595-nm pulsed dye laser in treatment of facialtelangiectatic erythema. J Cosmet Dermatol 2019;18(3):783-787.
10- Garden BC, Garden JM, Goldberg DJ. Light-based devices in the treatment of cutaneous vascular lesions: An updated review. J Cosmet Dermatol 2017;16(3):296-302.
11- McCoy SE. Copper bromide laser treatment of facial telangiectasia: results of patients treated over five years. Lasers Surg Med 1997;21(4):329-40.
12- Uebelhoer NS, Bogle MA, Stewart B, Arndt KA, Dover JS. A split-face comparison study of pulsed 532-nm KTP laser and 595-nm pulsed dye laser in the treatment of facial telangiectasias and diffuse telangiectatic facial erythema. Dermatol Surg 2007;33:441-8.
13- Tanghetti, EA. Split-face randomized treatment of facial telangiectasia comparing pulsed dye laser and an intense pulsed light hand piece. Lasers Surg Med 2012;44:97-102.
14- Tierney E, Hanke CW. Randomized controlled trial: Comparative efficacy for the treatment of facial telangiectasias with 532 nm versus 940 nm diode laser. Lasers Surg Med 2009;41:555-62.
15- Sarac G, Kapicioglu Y, Cenk H. An evaluation of the efficacy of a single-session 577 nm pro-yellow laser treatment in patients with postacne erythema and scarring. Dermatol Ther 2021;34(1):e14611.
16- Moustafa F, Lewallen RS, Feldman SR. The psychological impact of rosacea and the influence of current management options. J Am Acad Dermatol 2014;71:973-80.
17- Tsunoda K, Akasaka K, Akasaka T, Amano H. Successful treatment of erythematotelangiectatic rosacea with intense pulsed light: Report of 13 cases. J Dermatol 2018;45:1113-1116.