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CASE REPORT

Rhodamine intense pulsed light versus conventional intense pulsed light for facial telangiectasias

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ABSTRACT

Facial telangiectasias represent the major aesthetic alterations of several chronic inflammatory disorders arising on facial skin. We herein report on relevant clinical results of a new subtype of intense pulsed light treatments, the so-called rhodamine intense pulsed light (r-IPL), in comparison with conventional IPL (c-IPL) treatments on forty-five patients affected by facial telangiectasias. The aim of this study is to determinate whether r-IPL represents an effective and safe treatment for the most common superficial vascular alterations and could be advised as a first choice therapy for facial telangiectasias.

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Intense pulsed light; rhodamine intense pulsed light; facial telangiectasias

Introduction

Facial telangiectasias represent a common expression of several pathological conditions, such as sensitive skin, rosacea, irritant contact dermatitis, lupus erythematosus, psoriasis, atopic dermatitis, and senile angiomatosis, thus comprising a large majority of patients seen in dermatology practice (1–4). Skin phototypes I, II, and III, a significant sun exposure history, and longstanding couperose and/or rosacea are considered the most important risk factors for the onset of facial telangiectasia. Cosmeceutical and physical treatments are always associated in the therapeutic scheme of such complex skin alterations. The non-pharmacologic approach aims to reduce inflammatory alterations, to restore and protect skin barrier, and to prevent ultraviolet (UV) and infrared A (IR-A) photo-induced skin alterations; active cosmetics routinely used comprise adequate skin care, and trigger avoidance and photoprotection. In addition, several topical, herbal, systemic, and light-based therapies are available and useful: *Aloe vera*, bisabolol, *Ginkgo biloba*, green tea and allantoin as topical anti-inflammatory, and panthenol (Vit. B5). Treatments with metronidazole, topical sodium sulfacetamide, doxycycline, and azelaic acid are also approved by Food and Drug Administration (FDA). In dermatologic practice, laser devices for this kind of skin disorders include 532-nm potassium titanyl phosphate or KTP, 595-nm pulsed dye laser (PDL), 755-nm alexandrite laser, intense pulsed light (IPL), and 1064-nm Neodymium yttrium aluminum garnet laser (Nd:YAG) (3–7). To exert its effect, laser needs to reach the same depth of target vessel and laser exposure needs to be long enough to cause a sufficiently slow coagulation of the vessel. This mechanism of action is called selective photothermolysis. The preferential absorption of photoenergy by the target chromophore at specific wavelength of light creates thermal energy, and then a selective destruction of oxygenated and deoxygenated hemoglobin with only minimal damage to the surrounding tissues, thus leading to a selective destruction with minimal scarring (2, 9).

An innovative pulsed light source containing dye optimized for producing wavelength of 595 nm has been used thanks to the RightLight technology (Synchro VasQ, Deka M.E.L.A., Italy). This new kind of IPL, the so-called rhodamine IPL (r-IPL) has wavelength optimized for 595 nm, a maximum fluence of 25 J/cm^2, and pulse duration ranging from 3 to 24 ms. Two different spot sizes of 2 cm^2 and 6 cm^2 are available. Epidermal cooling is provided by the handpiece.

Materials and methods

Forty-five patients affected by facial telangiectasias have been selected and subsequently treated [31 females and 14 males; median age 41.7 (range 12–68) years; Fitzpatrick skin types I–IV]. The exclusion criteria included diabetes mellitus, cardiovascular diseases, and use of anticoagulant drugs. In addition, the following patients were excluded from treatment with Nd:YAG laser: patients taking photosensitizing drugs, anticoagulants, and retinoids (which could alter the normal tissue repair), patients with bacterial, viral, or mycotic infections, and patients recently exposed to the sun or UV lamps. Each patient involved in this study signed an informed consent form for undergoing a conventional IPL (c-IPL) treatment or a new kind of IPL treatment, and for collecting clinical data for scientific investigations.

Patients were randomly divided in three homogeneous groups of fifteen each, and underwent to three different treatment schemes as follows:

Group A: 15 patients (10 females, 5 males; median age 37.7 (range 12–51)). Scheme treatment: c-IPL's scheme treatment

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(PhotoSilk+, DekaMela, Italy), with a filter of 500–900 nm, a spot size of 4.6 cm^2, and 2 passes on the same area. Parameters: fluence ranging from 14 to 17 J/cm^2, two pulses of 5 and 10 ms, respectively, and a delay between pulses of 10 ms.

Group B (Group *r-IPL 1 pass*): 15 patients (10 females, 5 males; median age 44.8 (range 21–68)). Scheme treatment: single-pass r-IPL. Parameters: fluence ranging between 18 and 23 J/cm^2, double pulse at 8 ms, and delay of 10 ms between pulses.

Group C (Group *r-IPL 2 pass*): 15 patients (11 females, 4 males; median age 42.8 (range 23–62)). Scheme treatment: double-pass r-IPL. Parameters: fluence ranging between 18 and 23 J/cm^2, double pulse at 8 ms, and delay of 10 ms between pulses for the first pass; fluence ranging between 18 and 20 J/cm^2, double pulse at 8 ms, and delay of 10 ms for the second pass.

A test dose was performed at the initial consultation, and thereafter patients were reviewed and treated at 2-week intervals. Burning sensation was referred from mild to moderate by all patients, thus meaning that the handpiece's epidermal cooling provided resulted sufficient.

Dermoscopic digital images of all patients were taken at the initial visit, and before and immediately after each IPL session using a digital camera (Canon PowerShot A360) equipped with a special dermoscopic objective (Dermlite Photo, 3GEN LLC, San Juan Capistrano, CA, USA). Each picture has been stored in a digital database with the aim of objectively verifying the effectiveness of either conventional IPL or r-IPL treatment.

The patients were followed up every two weeks for 5 treatments each and have been globally evaluated and subsequently classified with photographic records into five categories: excellent results (C-I), marked improvement (C-II), partial response (C-III), poor response (C-IV), and no change or worsening (C-V).

The staff obtained patient's opinion of pain and discomfort by asking each patient, immediately after each treatment, to rate pain and discomfort experienced during the treatment, by means of a pain and discomfort scale ranging from 0 to 5, where 0 means no pain and 5 means intolerable pain. Moreover, a post-treatment evaluation of all the patients was performed with an examination of the treated areas within 15 minutes after each treatment, to rate erythema by means of a severity scale (mild, moderate, and severe).

Results and discussion

Results

No statistical difference was observed among age or gender of patients. As a result of the first session, a marked improvement of patients' condition (C-II) was observed in 6/15 (40%) of patients in Group A as well as in Group B, whereas 7/15 patients (47%) of Group C showed C-II results. Differences in improvements were statistically significant ($p < 0.05$). According to results of the third session, C-I results were 12/15 (80%) for Group A, 11/15 (73%) for Group B, and 14/15 (93%) for Group C, respectively. Finally, at the end of the fifth session, C-I results have been achieved in 45/45 (100%) patients (Table 1).

Examples of C-I, C-II, and C-III improvements are illustrated in Figures 1–3. Figure 4 highlights the dermoscopic differences before and at the end of the treatments. Of special interest, 100% (30/30) of patients treated with r-IPL (both Group B and C) improve at the end of the fifth session without side effects. Patients belonging to Group A, and thus treated with c-IPL, seem to achieve results at early sessions, but they sometimes need a systemic corticosteroid therapy. These results are summarized in Table 1 and Graph 1. Interestingly, both c-IPL and r-IPL require a minimum of 2–3 treatment sessions to achieve marked results.

Side effects of each treatment scheme are summarized in Table 2 and Graph 2. Almost all patients well tolerated the proposed therapeutic scheme; pain is referred as mild to moderate only around 2–3 min after treatment, and more intense with c-IPL in comparison with r-IPL (Table 3 and Graph 3). Notably, r-IPL patients did not show any side effects with a scheme treatment of one session every 15 days for five times, whereas c-IPL patients showed mild-to-moderate erythema and/or edema (Table 4 and Graph 4), sometimes in association with a slight crusting, and 4 out of 15 patients of Group A (27%) required 2 mg of systemic corticosteroid for 3 days.

Discussion

Treatment of facial telangiectasias also comprises several cosmeceuticals and physical treatments, but laser devices could be suggested for achieving marked and definitive results.

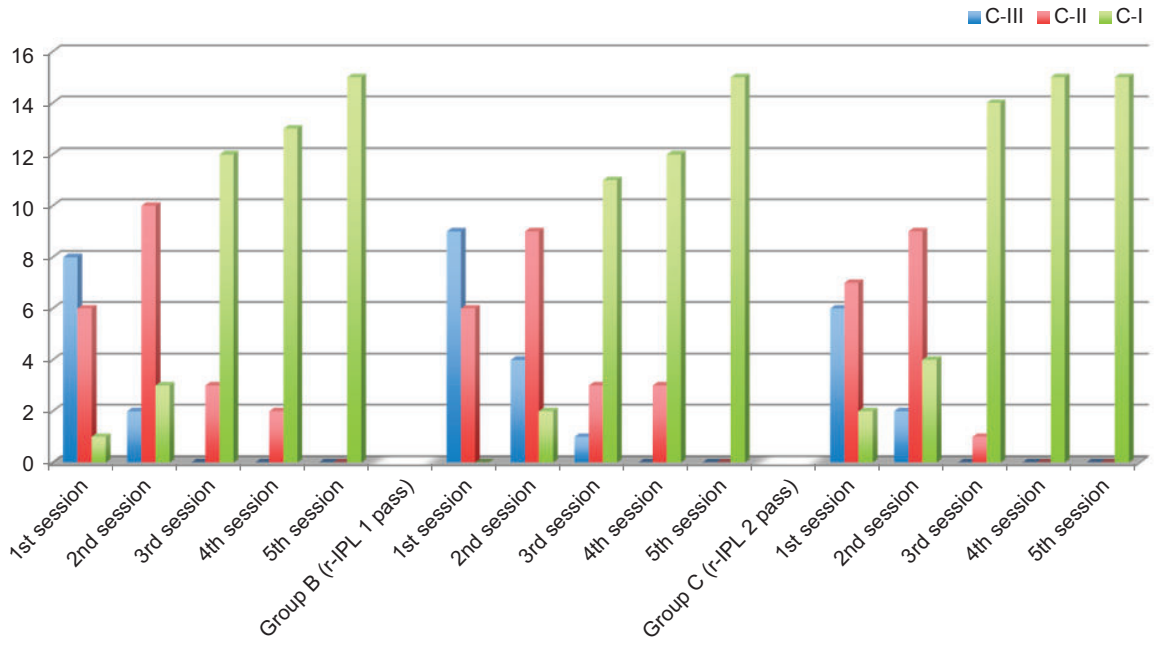
According to the literature, IPL is reported to be a supplement or an alternative therapy for this kind of disorders, firstly suggested by Schroeter and Neumann in 1998. In 2003, a pilot study of Mark et al. demonstrated a 30% decrease in blood flow, a 29% decrease in area for telangiectasias, and a 21% decrease in erythema intensity after five sessions of c-IPL. In 2005, three interesting publications reported promising results for c-IPL as an effective device in rosacea patients. Clementoni et al. reported a 75–100% clearance with 1–2 c-IPL sessions in 87% of selected patients with a double pulse mode using 570-nm cut-off filter with pulse times of 4.0 ms, delay of 30 ms. Meanwhile, Taub et al. reported 83% decrease in redness, 75% decrease in flushing, and 64% decrease in acneiform breakouts with 1–7 sessions of c-IPL. Finally, Schroeter et al. reported on efficacy of c-IPL for long-term clearance of telangiectasias associated with rosacea, with 78% marked improvement and less than 1% recurrence over a 3-year follow-up period with c-IPL parameters ranging from 515 to 1200 nm with different pulse durations between 2 and 6 ms, single or multiple pulse mode with 15-ms pulse delay. In 2009, Neuhaus et al. performed a randomized, single-blind, controlled, split-face trial comparing a series of patients with facial telangiectasias treated at long-pulsed light (595 nm, PDL) versus patients treated with c-IPL. These two devices showed similar efficacy and safety, thus leading the authors to suggest their use as therapeutic options for the treatment of this kind of facial skin disorders (1–14).

Up to now, several studies stated the great sensitivity and specificity of dermoscopic examination in diagnosing pigmented skin lesions, non-melanoma skin cancers, and, more recently, viral and inflammatory skin conditions.

Recently, we demonstrated the usefulness of dermoscopy in lasers and c-IPL treatments (15–17). Our results proved that this technique should be considered in laser protocols as a follow-up tool due to its extreme accuracy in identifying the

Table 1. Investigator's assessment of improvement in lesions after each session.

Group A (c-IPL 2 pass)	C-III	C-II	C-I
1st session	8	6	1
2nd session	2	10	3
3rd session	0	3	12
4th session	0	2	13
5th session	0	0	15
Group B (r-IPL 1 pass)			
1st session	9	6	0
2nd session	4	9	2
3rd session	1	3	11
4th session	0	3	12
5th session	0	0	15
Group C (r-IPL 2 pass)			
1st session	6	7	2
2nd session	2	9	4
3rd session	0	1	14
4th session	0	0	15
5th session	0	0	15



Graph 1. Investigator's assessment of improvement in lesions after each session. C-III (partial response category), blue columns; C-II (marked improvement category), red columns; C-I (excellent results category), green columns.

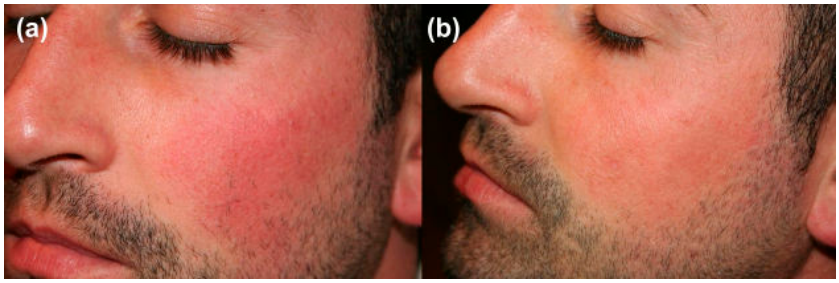


Figure 1. (a) Facial telangiectasias of a patient before treatment, (b) facial telangiectasias in the patient after fourth session of the c-IPL treatment, Category-II (marked improvement).

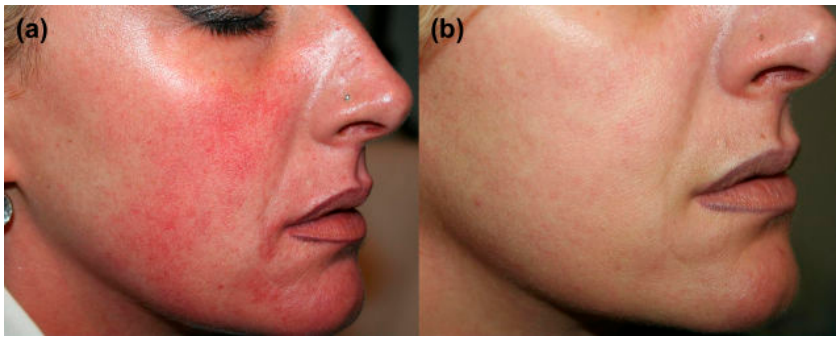


Figure 2. (a) Facial telangiectasias of a patient before treatment, (b) facial telangiectasias in the patient after fourth session of the r-IPL treatment, Category-I (excellent improvement).

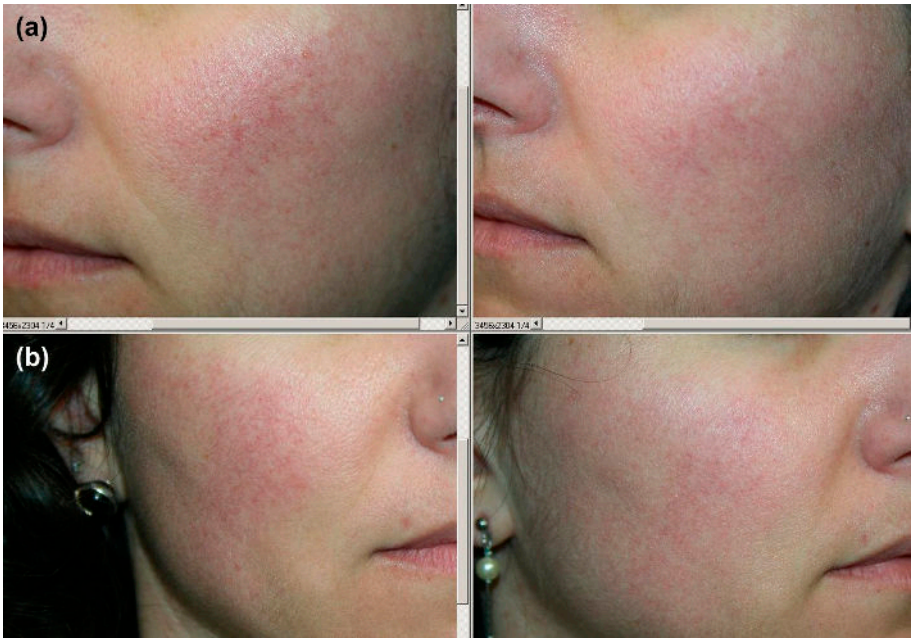


Figure 3. (a) Facial telangiectasias of a patient before treatment, (b) facial telangiectasias in the patient after third session of the r-IPL treatment, Category-II (marked improvement).

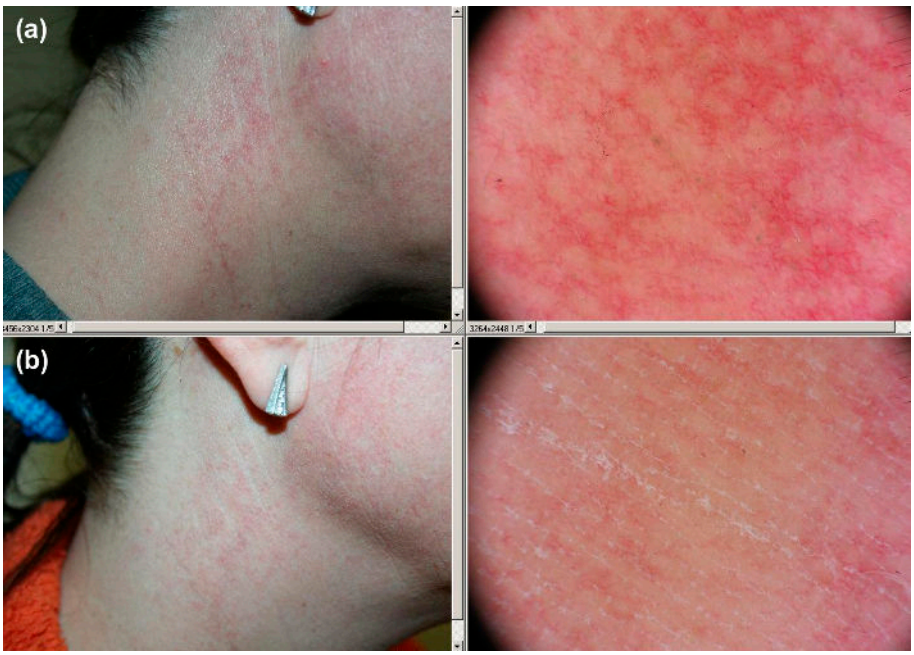
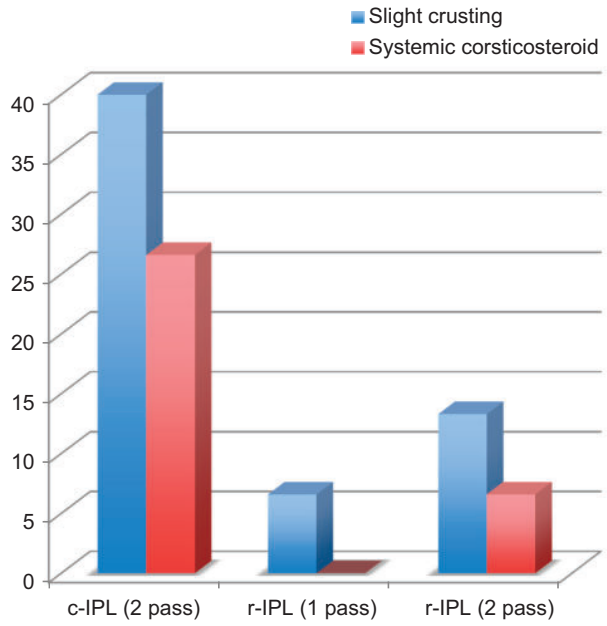


Figure 4. (a) Dermoscopic facial telangiectasias of a patient before treatment, (b) Dermoscopic facial telangiectasias of the same patient after the third session of r-IPL treatment.

Table 2. Reported side effects.

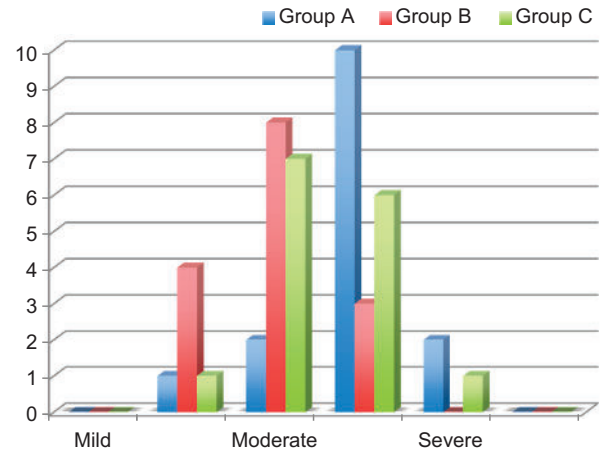
Side effects reported	c-IPL (2 pass)	r-IPL (1 pass)	r-IPL (2 pass)
Slight crusting	6/15 (40%)	1/15 (6,6%)	2/15 (13,3%)
Systemic corsticosteroid	4/15 (26,6%)	0	1/15 (6,6%)
	c-IPL (2 pass)	r-IPL (1 pass)	r-IPL (2 pass)
Slight crusting	40	6.6	13.3
Systemic corsticosteroid	26.6	0	6.6



Graph 2. Percentage of reported side effects.

Table 3. Subject's opinion of pain and discomfort (no. of patient).

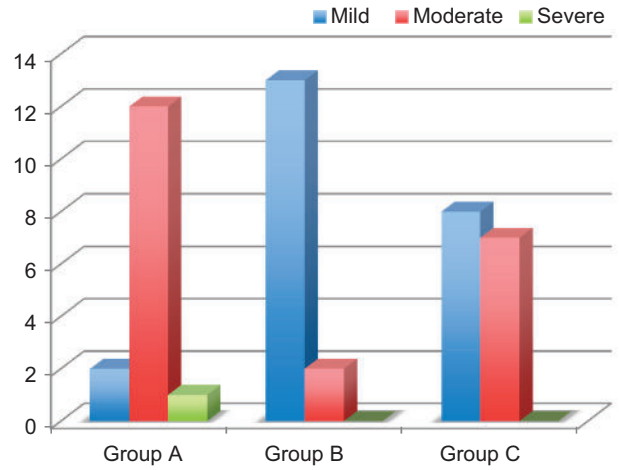
	Group A	Group B	Group C
Mild	0	0	0
	1	4	1
Moderate	2	8	7
	10	3	6
Severe	2	0	1
	0	0	0



Graph 3. Subject's opinion of pain and discomfort (% of patient).

Table 4. Post-treatment evaluation (no. of patients) of transient erythema (within 15 minutes after treatment).

	Group A	Group B	Group C
Mild	2	13	8
Moderate	12	2	7
Severe	1	0	0



Graph 4. Post-treatment evaluation (% of patients) of transient erythema (within 15 minutes).

target. Moreover, in most cases dermoscopy enabled immediate prediction of treatment results.

Lasers aim to hit the target of vascular lesions, the oxyhemoglobin, which presents three wavelength absorption peaks (418, 542, and 577 nm). In our opinion, numerous variables should be considered for evaluating lasers in treatment of superficial cutaneous vascular lesions, such as depth and diameter of vessels, laser wavelength, pulse width, and spot size. The wavelength chosen must have sufficient penetration depth for the target vessels, whereas pulse duration depends on diameter of the target vessels (8–12).

The present dye lasers, which use rhodamine as the active medium, allow producing wavelengths ranging between 585 and 600 nm. These wavelengths may penetrate into deeper tissues, while maintaining high hemoglobin selectivity. The undisputed therapeutic advantage of these wavelengths, linked to the hemoglobin absorption selectivity, could lead to some discomfort because of the possible formation of purple bruises. In addition to the above-mentioned laser systems, technological innovation has introduced pulsed light systems, which allow for broadband emissions, with a spectrum of wavelengths ranging between 500 and 1200 nm. Pulsed light systems allow hitting the target of the vascular component at several wavelengths, exploiting both the components of the laser and other wavelengths that fall within their emission spectrum. The largest limit of pulsed light in vascular treatment, however, is represented by the higher energy emission in the infrared, leaving a lower percentage of light energy in the visible emission, where both the hemoglobin absorption peaks and typical wavelengths of dye laser systems are located. Moreover, the emission over the entire visible spectrum involves the pigmentary component in the skin tissue, which covers the entire visible spectrum with greater selectivity for increasingly shorter wavelengths. The RightLight technology handpiece, on the Synchro

VasQ platform, is a pulsed light system that allows enhancing emission performance in the wavelength range between 550 and 650 nm, in order to obtain pulsed light performance closer to that of dye laser, thereby creating an effective and more comfortable treatment. The system uses rhodamine as a fluorescent substance that can absorb the wavelengths in the UV spectrum up to 550 nm and emit them again in fluorescence within a range between 550 and 650 nm, with a rhodamine peak around 570 nm. During this transformation, rhodamine can be considered as an active filter, which, unlike conventional filters of IPL, is able to recycle energy instead of losing it.

We report a comparative study between two different subtypes of IPL, to evaluate efficacy, safety, and, eventually, superiority of the new r-IPL for its vessel-specific wavelength. In our study, pain did not affect the patients' compliance to treatments in all groups but side effects occurred more commonly after c-IPL sessions than r-IPL sessions. This benefit, combined with the excellent results obtained with r-IPL in both Groups B and C, lead us to suggest its use as treatment of choice for facial telangiectasias. Since patients of Group B did not refer any side effects, such as intense erythema or slight crusting, the authors decided to test an increase fluence (2 passes) in patients belonging to Group C, thus achieving marked results with reduced sessions.

Our experience demonstrated that the r-IPL represents an effective and safe treatment for the most common superficial vascular alterations and could be suggested as a first choice therapy for facial telangiectasias. We would like to underline the importance of an expert operator able to set the best fluence and right pulse duration depending on patients' skin type and lesions' features, such as number and depth of vessels. Moreover, dermoscopy once again proved to be a diagnostic and prognostic valid tool, by highlighting the effective response of telangiectasias to both c-IPL and r-IPL; thus, dermoscopic examination should be considered as an integral part of c-IPL or r-IPL treatment.

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Declaration of interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

References

1. Ciocon DH, Boker A, Goldberg DJ. Intense pulsed light: what works, what's new, what's next. Facial Plast Surg. 2009;25:290–300. Epub 2009 Dec 18.
2. Babilas P, Schreml S, Szeimies RM, Landthaler M. Intense pulsed light (IPL): a review. Lasers Surg Med. 2010;42:93–104.
3. Zoccali G, Piccolo D, Allegra P, Giuliani M. Melasma treated with intense pulsed light. Aesthetic Plast Surg. 2010;34:486–493. Epub 2010 Mar 12.
4. Myers P, Bowler P, Hills S. A retrospective study of the efficacy of intense pulsed light for the treatment of dermatologic disorders presenting to a cosmetic skin clinic. J Cosmet Dermatol. 2005;4:262–266.
5. Schroeter CA, Haaf-von Below S, Neumann HA. Effective treatment of rosacea using intense pulsed light systems. Dermatol Surg. 2005;31:1285–1289.
6. Papageorgiou P, Clayton W, Norwood S, Chopra S, Rustin M. Treatment of rosacea with intense pulsed light: significant improvement and long-lasting results. Br J Dermatol. 2008;159:628–632.
7. Taub AF, Devita EC. Successful treatment of erythemato-telangiectatic rosacea with pulsed light and radiofrequency. J Clin Aesthet Dermatol. 2008;1:37–40.
8. Menezes N, Moreira A, Mota G, Baptista A. Quality of life and rosacea: pulsed dye laser impact. J Cosmet Laser Ther. 2009;11:139–141.
9. Dahan S. Laser and intense pulsed light management of couperose and rosacea. Ann dermatol Venereol. 2011;138 (Suppl. 3):S219–222.
10. Bencini PL, Tourlaki A, De Giorgi V, Galimberti M. Laser use for cutaneous vascular alterations of cosmetic interest. Dermatol Ther. 2012;25:340–351.
11. Erceg A, de Jong EM, van de Kerkhof PC, Seyger MM. The efficacy of pulsed dye laser treatment for inflammatory skin diseases: a systematic review. J Am Acad Dermatol. 2013;69:609–615.e8.
12. Shim TN, Abdullah A. The effect of pulsed dye laser on the dermatology life quality index in erythematotelangiectatic rosacea patients: an assessment. J Clin Aesthet Dermatol 2013;6:30–32.
13. Salem SA, Abdel Fattah NS, Tantawy SM, El-Badawy NM, Abd El-Aziz YA. Neodymium-yttrium aluminum garnet laser versus pulsed dye laser in erythemato-telangiectatic rosacea: comparison of clinical efficacy and effect on cutaneous substance (P) expression. J Cosmet Dermatol. 2013;12:187–194.
14. Erol OO, Gurlek A, Agaoglu G, Topcuoglu E, Oz H. Treatment of hypertrophic scars and keloids using intense pulsed light (IPL). Aesthetic Plast Surg. 2008;32:902–909. Epub 2008 Jun 17.
15. Piccolo D. The usefulness of dermoscopy in laser and intense pulsed light treatments. 2012; Remo Sandron Edition. Florence (Italy).
16. Piccolo D, Di Marcantonio D, Crisman G, Cannarozzo G, Sannino M, Chiricozzi A, Chimenti S. Unconventional use of intense pulsed light. BioMed Res Int. 2014;2014:618206. doi: 10.1155/2014/618206.
17. Sevila A, Nagore E, Botella-Estrada R, Sanmartin O, Requena C, Serra-Guillen C, Guillen C. Videomicroscopy of venular malformations (port-wine stain type): prediction of response to pulsed dye laser. Pediatr Dermatol. 2004;21:589–596.