

THE EFFICACY OF IPL 560 NM WAVELENGTH IN THE TREATMENT OF ERYTHEMATOTELANGIECTATIC ROSACEA

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ABSTRACT

Introduction: Rosacea is a chronic inflammatory skin diseases affecting the face. Generally, it has many types like erythematotelangiectatic, papulopustular, phymatous, ocular and granulomatous. There are a large variety of treatment methods for its treatment including topical treatments and systemic treatments. Recently many light and laser-based treatments been developed for rosacea treatment including intense pulsed light, pulsed dye laser, and neodymium doped yttrium aluminum garnet. In this study we used intense pulsed light therapy with 560 nanometer filter and lower energy that routinely used formerly.

Methods: a total of 50 patients with erythematotelangiectatic rosacea enrolled in the intense pulsed light treatment with 560 nanometer filter. The clinical outcomes evaluation of the results of the treatment was done by using clinical erythema assessment score and telangiectasia area involvement score.

Results: after completion of treatment sessions and a long term follow up at 12 weeks after that both erythema and telangiectasia scores declined significantly. There was very little adverse effects been reported during and at 12 week follow up assessment. Additionally, the patients reported better general outlook of their skin

Conclusion: intense pulsed light treatment sessions, at 560 nanometer cut off filter and 15 joules/cm² achieve a significant improvement and clearance of both erythema and telangiectasia.

KEYWORDS: Erythematotelangiectatic rosacea, intense pulsed light (IPL), clinical erythema assessment, telangiectasia area involvement score.

INTRODUCTION

Rosacea is a chronic inflammatory skin disease mainly affecting the facial convexities [1]. Generally, rosacea prevalence among the population is 5.5%, with an equal percentage between men and women [2]. Populations that have fair skin of Celtic and Northern European descent are more affected than other populations [3]. The classification and diagnosis of this condition are based on clinical findings like erythematotelangiectatic, papulopustular, phymatous, ocular, and granulomatous types [4]. Among these clinical findings, the single most important sign is persistent erythema of facial skin [5].

The pathogenesis of rosacea is multifactorial and complex, with neurovascular dysregulation being the central component, mainly represented by the overexpression of transient receptor potential channels on different cells. This dysregulation leads to an increase in vascular and lymphatic dilation in the erythematotelangiectatic type of rosacea [6]. Another factor of pathogenesis is immune system dysregulation, which occurs in both innate and adaptive profiles [7]. Apart from that, there are many other factors implicated in rosacea, like dysbiosis of the skin and gut, as well as genetic and environmental factors [8,9,10].

The complex pathogenesis of rosacea necessitates the use of multiple therapeutic approaches. The first approach is an appropriate skin care routine [11]. The second therapeutic approach is topical therapy like azelaic acid, metronidazole, sodium sulfacetamide/sulfur, oxymetazoline hydrochloride cream, ivermectin cream, etc. [12]. Oral therapy is another approach consisting of tetracyclines, macrolides, isotretinoin, metronidazole, and beta-blockers [13]. The mentioned treatments proved to have limited efficacy in addressing vascular problems such as longstanding facial erythema and telangiectasia [14].

The unmet need for long-lasting, nonpharmacologic therapies has driven interest in light and laser-based therapies, such as intense pulsed light (IPL) and pulsed dye laser (PDL) [15]. Long-pulsed neodymium-doped yttrium aluminum garnet (Nd:YAG) and potassium titanyl phosphate (KTP) lasers are also commonly option in the treatment of rosacea [16].

IPL is a treatment modality that is non-invasive, with a rapid onset of action and relatively few adverse effects [17]. IPL achieved a robust efficacy rate in the treatment of telangiectasia and erythema in rosacea, securing a lower recurrence rate at a 2-year follow-up [18]. In this study we tried to optimize between the efficacy of IPL and minimizing its adverse effects in the treatment of erythematotelangiectatic rosacea, where we tried IPL with 560 nm filter and low energy as 15 J/cm².

METHODOLOGY

An interventional clinical trial was conducted in the Erbil Dermatology Teaching Center in the Erbil Kurdistan region-Iraq from 24th November 2024 to 17th August 2025. The subjects of this study were adults aging 18 years or older who met the diagnostic criteria of erythematotelangiectatic rosacea. Out of these population, any patient who had any of the following criterion were excluded from the study: topical treatment prior to one month, received laser or light therapy prior to six months, history of malignancies or photosensitivity disorders, and for ladies, pregnant and lactating individuals. Totally 50 patients were eligible for all criteria and passed for the evaluation and treatment sessions. The ethical approval for this study was obtained from the ethical committee of college of medicine/ Hawler Medical University, Erbil City, Kurdistan-Iraq. After acquiring consent form the patients, data were collected from the patients regarding baseline patients' information including socio-demographic details and medical history.

Outcomes measurement:

Baseline clinical assessment of rosacea and outcomes measurement of the treatment sessions effect were done by clinical erythema assessment (CEA) [19] and telangiectasia area involvement score (TAIS) [20]. CEA is a validated 5-point scale used to measure the severity of facial redness in rosacea, ranging from 0 (clear) to 4 (severe) [19]. The TAIS was calculated by summation of obtained scores in all facial zones involved by rosacea; glabella (G), nose (N), right cheek (RC), left cheek (LC), and chin (C). In each zone, the percentage of telangiectasia involvement out of the total area of that zone is estimated from 0.0 to 1.0 then multiplied by the assigned total score to that zone. Then summation of all area will give the total score for TAIS ranging from 0 through 7. Figure 1[20]. All these assessments of the outcomes were done by two independent dermatologists. Figure 1. In addition to these two scales, the patients were asked at the end of treatment session to evaluate their rosacea condition subjectively by patient self-assessment (PSA) score, which has a 5-point scale used to measure a patient's own perception of facial erythema (redness) severity.

Treatment sessions:

Patients were subjected to IPL therapy utilizing SmoothCool® by Jeisys, using parameters of 560 nm, 1 Hz, 15 J/cm², with a spot size of 10X20 mm, and 2–3 passes on the affected area in each session with 10–20% overlap. No topical anesthesia used prior to IPL irradiation. A 5–8-mm-thin layer of coupling gel was applied to the entire face. The sessions were repeated every 2 weeks up to 4 sessions, with a follow-up visit and photography to assess the final effect of the treatment, 3 months after the last session. Baseline and subsequent follow-up photos of each patient's face were taken.

Statistical Analysis

The Statistical Package for the Social Sciences software, version 26, was used to statistically analyze the obtained data. While the independent sample t-test was used to analyze continuous parameters, the Chi-square test was used to analyze categorical variables, and repeated measures analysis was used for continuous variables. The level of significance was deemed significant if it was 0.05 or lower.

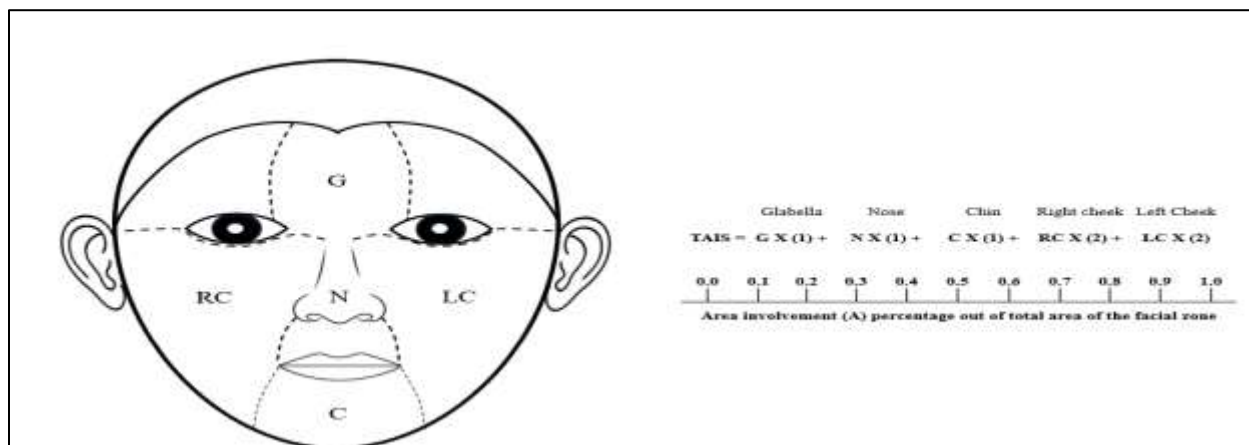


Figure 1: TAIS for facial telangiectasia area involvement on the rosacea affected areas

RESULTS

The study included 50 patients with erythematotelangiectatic rosacea and a mean age of 48.7 years. Most patients (68%) were between 40 and 59 years old. Female patients outnumbered male patients (84% vs. 16%). The majority of patients (86%) were married, reported a moderate socioeconomic status, and lived in urban residences. A significant portion of the patients (78.0%) were unemployed (housewives). Table 1.

Table 1: Sociodemographic characteristic of patients (n=50)		
Parameters	N	Percentage (%)
Age		
Mean±SD (years)	48.7±9.8 Years	
≤ 40 years	7	14.0
40-49 year	18	36.0
50-59 years	16	32.0
≥ 60years	9	18.0
Gender		
Male	8	16.0
Female	42	84.0
Marital status		
Single	6	12.0
Married	43	86.0
Divorced	1	2.0
Socioeconomic status		
Poor	5	10.2
Moderate	42	85.7
Good	2	4.1
Residence n		
Urban	44	88.0
Rural	6	12.0
Occupation		
Student	1	2.0
Governmental employee	5	10.0
Privet employee	5	10.0
Unemployed	39	78.0

The mean duration of rosacea was 27.7 months; the majority of patients (70%) had rosacea for 12–36 months. Regarding prior treatment, 16% of patients had not received any treatment before, while the most common historical approach was systemic treatment (40%), followed by laser treatment (20%). The mean duration for which patients had received prior treatments was 11.5 months. Table 2.

Table 2: Clinical characteristics of rosacea among study patients (n=50)		
Parameters	N	Percentage (%)
Duration of rosacea		
≤12 monthes	8	16.0
12-36 monthes	35	70.0
≥36 monthes	7	14.0
Type of treatment		
No treatment	16	16.0
Topical treatments	2	4.0
Systemic treatments	20	40.0
Laser based treatments	10	20.0
Systemic and Laser	1	2.0
Topical and systemic	1	2.0
Duration of treatment		
< 12monthes	16	47.1
≥12monthes	18	52.9

Follow up and outcomes measurements:

Generally, we had two time points for overall outcomes measurements; after 4 treatment sessions of IPL and at 3 months after the final session. Regarding erythema, there was a highly significant decline in erythema scores through the sessions and after 12 weeks follow up after the treatment ($p < 0.001$). It is worth to mention that, after the first and second sessions, there was no achievement of score "clear", whereas after by the fourth session, about 44% of patients presented with a clear score. Surprisingly percent of the patients achieved clearance of erythema was increasing at the 12 weeks check after finishing treatment session to 72%. It is worth to mention that there was a dynamic change in the total mean erythema scores of the patients over the time: about 22% rate of improvement was observed after the third and fourth session, and this value was increased to 28% improvement, which was checked after 12 weeks of the end of treatment sessions. Table 3, Figure 2 and 3. Concerning telangiectasia, following four treatment sessions of IPL 560 nm, the mean TAIS score significantly declined through the sessions and after 12 weeks follow up after the treatment ($p < 0.001$). Regarding the mean change of telangiectasia score all over the patients ($n=50$), there were no baseline score changes occurred after first session, followed by a mean change of 0.64 after second session, 1.8 after third session, and 2.36 after fourth session, and progressing improvement was observed to 3.01 after 12 weeks from the completion of treatment sessions. Additionally, other clinical benefits were observed in terms of improvements in overall skin tone and reductions in skin irritability and pruritus (itching) were documented as feedback from the patients. Table 3, Figure 2 and 3.

Table 3: Results of assessment of erythema and telangiectasia among patients with rosacea after treatment session and 12 weeks follow up (n=50)

Score	Score evaluation after treatment sessions				After 12 weeks form treatment	p value
	1 st session	2 nd session	3 rd session	4 th session		
	N (%)	N (%)	N (%)	N (%)	No. (%)	
CEA						<0.001 ^s
Clear	0	0	11 (22.0)	22 (44.0)	36 (72.0)	
Almost clear	0	4 (8.0)	12 (24.0)	12 (24.0)	11 (22.0)	
Mild	8 (16.0)	15 (30.0)	16 (32.0)	11 (22.0)	3 (6.0)	
Moderate	16 (32.0)	22 (44.0)	10 (20.0)	4 (8.0)	0	
Severe	26 (52.0)	9 (18.0)	1 (2.0)	1 (2.0)	0	
Mean change (%)	0	0	22.0	22.0	28.0	
TAIS						<0.001 ^s
Mean (±SD)	3.36 (0.74)	2.72 (0.85)	1.56 (1.1)	1.0 (0.9)	0.35 (0.2)	
Mean change (mean)	0	0.64	1.8	2.36	3.01	

The adverse effects:

Following the treatment sessions of IPL 560 nm, only one patient complained of post-treatment scaling after the fourth session. Over the course of the four intense pulsed light treatment sessions, there was a highly significant decline in erythema-related side effects ($p < 0.001$). After the treatment sessions, the majority of cases did not experience itching by the fourth session. There was also a highly significant decline in burning and stinging side effects by the fourth session ($p < 0.001$). Table 4.

Table 4: Adverse effects of treatment with IPL dafter each session (n=50)

Side effects	Treatment sessions					P value
	1 st	2 nd	3 rd	4 th		
	N (%)	N (%)	N (%)	N (%)		
Scaling						0.9 ^{NS}
None	48 (96.0)	48 (96.0)	48 (96.0)	48 (96.0)		
Mild	1 (2.0)	1 (2.0)	1 (2.0)	1 (2.0)		
Moderate	1 (2.0)	1 (2.0)	1 (2.0)	1 (2.0)		

Erythema						<0.001^S
None	5 (10.0)	5 (10.0)	24 (48.0)	30 (60.0)		
Mild	28 (56.0)	28 (56.0)	21 (42.0)	17 (34.0)		
Moderate	16 (32.0)	16 (32.0)	5 (10.0)	3 (6.0)		
Severe	1 (2.0)	1 (2.0)	0	0		
Itching						0.7^{NS}
None	48 (96.0)	48 (96.0)	48 (96.0)	49 (98.0)		
Mild	1 (2.0)	1 (2.0)	2 (4.0)	1 (2.0)		
Moderate	1 (2.0)	1 (2.0)	0	0		
Burning						<0.001^S
None	5 (10.0)	4 (8.0)	11 (22.0)	21 (42.0)		
Mild	7 (14.0)	10 (20.0)	32 (64.0)	28 (56.0)		
Moderate	36 (72.0)	35 (70.0)	7 (14.0)	1		
Severe	2 (4.0)	1 (2.0)	0	0		
Stinging						<0.001^S
None	40 (80.0)	41 (42.0)	41 (82.0)	50 (100.0)		
Mild	10 (20.0)	9 (18.0)	9 (18.0)	0		

S=Significant, NS=Not significant.

Patients returned after 3 months to monitor for long-term side effects from the performed treatments, which were fundamentally non-existent. Table 4.

Table 5: Adverse effects at the after 3 months from the last treatment session (n=50)		
Adverse effects	N	Percentage (%)
Scaling		
None	50	100
Mild	0	0
Moderate	0	0
Itching		
None	50	100
Mild	0	0
Moderate	0	0
Burning		
None	44	88.0
Mild	6	2.0
Moderate	0	0
Sever	0	0
Stinging		
None	50	100
Mild	0	0



Figure 2: A 46 years old female patient with history of rosacea for 3 years. Presented CEA score of “severe” and telangiectasia score of 6. After 4 treatment sessions of IPL, CEA score becomes “almost clear” and the telangiectasia score reached 1.75, as well as improvement of skin quality. Sustaining these results through 12 weeks of follow up.



Figure 3: A 43 years old patient with history of rosacea for 5 years. CEA score “severe” with telangiectasia score 3. After 4 sessions of IPL, CEA score dropped to “almost clear” and telangiectasia to score 1.25. The outcomes sustaining through 12 weeks of follow up after finishing treatment sessions.

DISCUSSION

Rosacea is a chronic inflammatory disease characterized by transient or persistent erythema, telangiectasia, and inflammatory lesions. The essential components of the disease are persistent erythema and telangiectasia of the facial skin [1]. This study began with a demographic profiling of rosacea in the region, revealing a higher age incidence among the middle-aged population. The gathered information shows that 68% of the sample was between the ages of 40 and 59. This supports the theory that age is an important influencing factor in rosacea due to inflammaging and immunosenescence, which act as drivers of chronic inflammatory disease [21].

Treatment of rosacea, specifically the erythematotelangiectatic component, has proved to be highly challenging. IPL has established itself as an affordable, safe treatment procedure that does not worsen skin sensitivity, offers a largely pain-free method, and requires minimal to no post-procedure downtime [22]. IPL is a flashlamp-pumped light source providing a non-coherent, polychromatic output from 400 to 1200 nm. To deliver specific wavelengths of light, different filters are utilized, unlike PDL which uses monochromatic light, IPL single wavelength cannot be adjusted. Pulse mode of IPL, enables to split delivery of the energy into two, three, or four pulses with varying pulse delays, at which, the skin cools down and preventing adverse effects [23]. IPL has the added advantage of a large spot size that covers more surface area in one discharge (a 10x20 mm spot size covers 2 cm² per shot), making it economically appropriate since covering the same area with other devices requires roughly three times as many pulses [24].

Clinical studies of rosacea-associated erythema show that IPL can significantly reduce vascular redness and telangiectasia via different mechanisms. In vascular lesions, the target is hemoglobin, present as oxyhemoglobin or deoxyhemoglobin. The most potent absorption peaks are 418, 542, and 577–595 nm; the 418 nm and the other short wavelength within the visible light spectrum are also absorbed by melanin and may lead to post-treatment pigmentary changes. Therefore, the 577–595 nm wavelength spectrum is regarded to be highly suitable target for treating vascular lesions [25]. Taking consideration to the formerly mentioned information, we designed to use a 560 nm wavelength cutoff filter of IPL, to achieve photothermolysis without affecting melanocytes and causing dyspigmentation.

In this study, we enrolled 50 patients with a long history of erythematotelangiectatic rosacea, who underwent IPL treatment sessions. Generally, after 3rd session of treatment, their facial erythema score by CEA showed that nearly half of them (46%) achieved clear and almost clear scores, 22% and 24% respectively. Whereas percentage of the patient who have achieved clinical improvement of facial erythema dramatically increased after completion of fourth session to 68% patients (clear score in 44% and almost clear in 24%). After last check after 12 weeks from completion of treatment session, out of 50 patients, completely clearance of erythema observed in about 72% of the patients. It has been reported previously in another study that IPL treatment has a significant improvement of facial erythema in rosacea patient; however, they have used the higher energy (24-32 J/cm²) of IPL 560 nm cut-off [26]. This indicates that using the same cut off with lower energy as 15 J/cm² can be also effective in the erythema treatment among rosacea patients. In another study which was split face comparative study between PDL settings of 10-mm spot size, 7 J/cm², 6-ms pulse duration and cryogen cooling, versus IPL 560 nm cut-off filter on the other side of face, they found out that the clearance of erythema and telangiectasia are similar on both sides of the face, however they were using higher energy of power as high as 25 J/cm² [27]. In other words, we can say that our study setting of IPL parameters are comparable to the former mentioned study PDL setting too in the treatment of erythematotelangiectatic rosacea.

In this clinical study, the results of telangiectasia treatment with IPL aligned with the erythema improvements, showing progressive improvement from the initiation of the procedure through weeks 2, 4, 8, and 12 of follow-up. The decline in the mean telangiectasia score from 3.36 at the baseline to 1.0 after completion of fourth session was substantial. More importantly, there was a steady decrease in the mean values of TAIS score throughout the 12 weeks of follow-up after 4th session, where there was achievement of almost total clearance of their mean score (TAIS=0.32). The significant reduction of telangiectasia in our study is comparable with the other studies [26,27], however progressive reduction of telangiectasia score after end of the treatment session through 12 weeks is showing superior results.

It is worth to mention that, in our study clinical outcomes improvements were not linearly increasing, but rather logarithmic. In more clarity, immediate response was not observed regarding the erythema clearance, i.e. no mean CEA score changes occurred in the first and second sessions. Instead, a clear difference emerged after third and fourth sessions, with a reduction in the mean CEA score to 22%, followed by an increment to 28% at 12 week follow up. Regarding telangiectasia reduction almost the same improvements occurred but with more faster declines in their scores. Over all the outcomes improvements were most encouraging finding after the end of treatment sessions, suggesting a continued therapeutic effect of IPL throughout the 12-week post-treatment period. In other hand, it has been reported in a study that the PDL has a better and quicker chance of clearing blood including telangiectasia in comparison to IPL [28], this might be due to a lack of built-in cooling systems in historical IPL devices, which limited the selection of aggressive parameters to have the same telangiectasia clearance.

As a therapeutic tool, IPL can carry side effects such as burns, blisters, vesicles, erosions, crust formation, and dyspigmentation [29]. These side effects can be avoided by using narrowband IPL (utilizing cutoff filters) and appropriate clinical parameters, as practiced in this study. IPL was used in this study as an independent monotherapy for rosacea, revealing a very low side effect profile. While 56% of patients experienced mild erythema after the procedure in the first session, this declined to 6% by the fourth session. Negligible scaling and itching sensations were

reported throughout the sessions. A moderate burning sensation was noted by 72% of patients initially; however, with the progression of sessions, the reported burning sensation decreased to 2% of patients. The stinging sensation was 20% at the start and reached 0% by the end of the IPL sessions. All of this low incidence of adverse effects may be related to the selection of lower energy (15 J/cm²) of IPL in the treatment sessions.

CONCLUSION

IPL treatment is increasingly proving itself as an effective monotherapy for erythematotelangiectatic rosacea. It offers a considerable remission time, a very low side effect profile, non-existent downtime, and remains an economically suitable procedure for patients.

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