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ORIGINAL ARTICLE

LONG PULSE 1064 NM ND: YAG LASER IN THE TREATMENT OF ERYTHEMATOTELANGIECTATIC ROSACEA AND OTHER ERYTHEMATOTELANGIECTATIC FACIAL CONDITIONS

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ABSTRACT

Background: Rosacea is a long-term inflammatory skin disorder that mainly affects middle-aged people. This study set out to assess how effective and well-tolerated a long-pulse 1064 nm neodymium-doped yttrium aluminium garnet (Nd:YAG) laser is for treating erythematotelangiectatic rosacea and similar facial redness conditions.

Materials & Methods: A prospective interventional study was carried out with 32 patients, each receiving 3–4 treatment sessions spaced two weeks apart. The laser settings used included a 5 mm spot size, fluence of 4.07 J/cm^2, energy of 800 mJ, and frequency of 5 Hz. Redness levels were evaluated using the Clinician's Erythema Assessment (CEA) and Patient Self-Assessment (PSA) scales, while visible blood vessels were measured using a new Telangiectasia Area Involvement Score (TAIS).

Results: Two weeks after the final session, the average CEA scores dropped significantly from 3.00 to 0.69 ($p < 0.05$), and PSA scores improved from 3.47 to 1.16 ($p < 0.05$). There was also a moderate improvement in telangiectasia. Side effects were mild and temporary, mainly short-term redness and slight itching.

Conclusion: Overall, the results suggest that long-pulse Nd:YAG laser treatment is both safe and effective in reducing facial redness in patients with erythematotelangiectatic rosacea.

KEY WORDS: Erythema; Laser Therapy; Rosacea; Solid-State; Telangiectasia.

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INTRODUCTION

Erythematotelangiectatic rosacea presents a persistent challenge in treatment due to its vascular symptoms and poor response to conventional drug therapies.[1] Although topical α-adrenergic agonists can temporarily reduce redness, their effects are short-term and do not address the underlying issue of dilated blood vessels (telangiectasia).[2] As a result, non-ablative laser treatments have become central to managing the condition, with the long-pulsed 1064 nm neodymium-doped yttrium aluminium garnet (Nd:YAG) laser standing out for its ability to penetrate deeply into the skin and selectively target oxyhemoglobin in blood vessels.[3]

Clinical evidence supports the use of Nd:YAG laser for treating rosacea.[4] For example, Salem et al. found that Nd:YAG laser provided superior clearance compared to the pulsed dye laser (PDL), with 73.3% of patients showing excellent results.[5] Similarly, Kwon et al. demonstrated effective treatment of nasal telangiectasia using the Nd:YAG laser without causing purpura (bruising).[6] Additionally, studies suggest that Nd:YAG therapy may reduce levels of substance P, a neuropeptide involved in rosacea's underlying mechanisms, pointing to potential disease-modifying effects beyond simple vascular reduction.[7]

However, challenges remain in defining optimal treatment parameters, particularly for patients with Fitzpatrick skin types III–IV, which are common in South Asian populations.[8] These skin types are at

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a higher risk for post-inflammatory complications, making it essential to adapt laser protocols accordingly.[9] Most available treatment guidelines come from studies conducted in European or East Asian populations, which may not be fully applicable to South Asian groups.[10] Additionally, while many studies use subjective overall evaluations to assess outcomes, there is a lack of quantifiable, anatomically specific methods for evaluating telangiectasia in rosacea patients.[11]

In clinical practice, patients with classic erythematotelangiectatic rosacea and those with steroid-induced facial telangiectasia, which can mimic rosacea, are frequently encountered.[12] However, there is no local evidence to guide laser treatment in this mixed group.[13] Given the lack of standardized treatment protocols and reliable scoring systems for telangiectasia in Kurdistan region, it is crucial to develop a reproducible Nd:YAG laser regimen that uses both validated erythema assessment scales and a new, anatomically weighted telangiectasia scoring system.[14]

This study aimed to evaluate the clinical efficacy, safety, and patient-reported outcomes of a standardized Nd:YAG laser treatment protocol in patients with erythematotelangiectatic rosacea and related facial vascular conditions at a dermatology teaching center in Kurdistan Region of Iraq.

MATERIALS & METHODS

We conducted an interventional study that enrolled 32 patients who were clinically diagnosed with the erythematotelangiectatic subtype of rosacea or related erythematotelangiectatic facial conditions, such as steroid-induced telangiectasia. The sample size was determined based on feasibility factors, including patient availability during a 10-month recruitment period at the dermatology teaching centre, and was consistent with comparable pilot studies evaluating laser efficacy in rosacea, which typically include 20 to 40 participants to identify clinically meaningful improvements in erythema and vascular scores.[5, 6, 15]

This sample had been selected among patients attending Erbil dermatology teaching centre, Erbil City, Iraq. Exclusion criteria included recent use (within one month) of oral antibiotics, oral retinoids, or topical treatments for rosacea; pregnancy or lactation; and a history of photosensitivity, connective tissue disease, or active malignancy.

The entire procedure was explained fully to the patients and a verbal consent was obtained. Full demographic data, and history of the condition were recorded. Later on, physical examination was performed for the assessment of erythema and telangiectasia. Erythema was graded from 0 to 4 using clinician erythema assessment scale CEA.[16] To the best of our knowledge, there is no scoring system to quantify the overall percentage of telangiectasia area involvement, so that we designed telangiectasia area involvement score (TAIS) from 0 to 7 numerically, where 0 score indicates no telangiectasia and 7 indicates all predilected sites totally involved. In this calculation five anatomical zones of the face were evaluated: glabella (G), nose (N), chin (C), right cheek (RC) and left cheek (LC). In each zone percentage of area involvement multiplied by the zone total assigned score. In each zone of glabella, nose and chin a total score of 1 was considered, while in cheeks, because of the large surface area we considered a total score of 2 in each side. Figure 1.

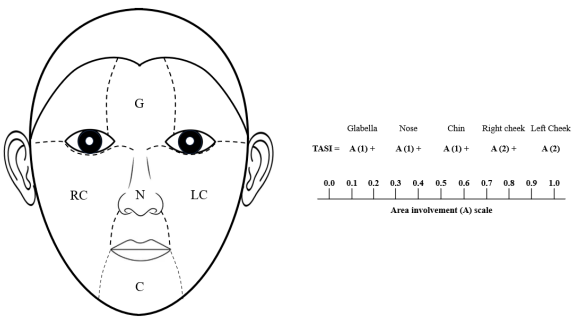

Figure 1: Calculation of the Telangiectasia Area Involvement Score (TAIS).

The TAIS was calculated by summation of obtained scores in all zones. In each zone the area (A) involved by telangiectasia estimated from 0.0 to 1.0 then multiplied by the assigned total score to that zone. The overall TAIS range is 0 through 7.

The entire face of each patient was treated with long-pulse 1064nm Nd:YAG laser, using Picolor® Dual Pulsed Q-Switch Nd:YAG Laser device, made in United Kingdom. The parameters that been used were spot size: 5mm, fluence: 4.07 J/Cm^2, energy: 800 mJ and frequency: 5 Hz. About 2-3 passes performed in each treatment session. Up to four sessions were performed for each patient with 2 weeks interval. Patients were asked to apply sunblock right after the procedure. To measure the response of the treatment sessions, evaluation of the erythema and telangiectasia was performed at baseline visit and two weeks after the last session. For each score, the mean of evaluation of two independent dermatologists using CEA scale were considered. The subjective assessment of erythema by the patients was done by PSA score at both base line and 2 weeks after the last treatment session. The PSA scale was ranged from no erythema (0) to severe erythema (4).[17]

The data obtained were analysed descriptively by using SPSS software version 21.

To conduct this study, the ethical approval been obtained from Kurdistan Higher Council for Medical Specialties (KHCMS) by the letter (No. 12/241-2023). From all patients the enrolment in the study was done after explaining the whole process of the study to

the patients and obtaining oral consent from them.

RESULTS

The study included 32 participants, of whom 24 (75%) were female. The mean age was 45.1 years, and most participants had Fitzpatrick skin type III (81.3%). A majority resided in urban areas (87.5%) and reported moderate socioeconomic status (68.8%), while only 6 (18.8%) were current smokers.

Table 1: Sociodemographic data of patients (n=32)

Parameters	Parameters	Parameters
Age in years (mean±SD)	45.09±10.23	
Sex		
Male	8	25.0
Female	24	75.0
Social Status		
Single	1	3.1
Married	30	93.8
Divorced	1	3.1
Socio-economic status		
Moderate	22	68.8
Good	10	31.2
Address		
Urban	28	87.5
Rural	4	12.5
Occupation		
Public employee	8	25.0
Self employed	6	18.8
Retired	1	3.1
Jobless	17	53.1
Smoking	6	18.8
Fitzpatrick's skin type		
II	6	18.8
III	26	81.3

According to Table 2, the mean duration of erythematotelangiectatic symptoms was 4.3 months. Twenty (62.5%) patients had a history of prior topical therapy, and 17 (53.1%) reported a positive family history of rosacea. Among the 24 female participants, 5 (20.8%) were using oral contraceptive pills, and 14 (58.3%) had experienced more than three pregnancies.

Table 2: Clinical characteristics of the patients

Parameters	No.	%
Duration of Rosacea and erythema-telangiectasia (in months) (mean±SD)	4.3±2.2	
Previous treatment		
No treatment	5	15.6
Topical treatment	20	62.5
Combined topical and systemic	7	21.9
Duration of previous treatment in months (mean±SD)	7.23±4.35	
Positive family history of rosacea	17	53. 1
History of taking OCP (n=24)	5	20.8
Parity (n=24)		
Nullipara	4	16.7
1-3 pregnancies	6	25.0
More than 3 pregnancies	14	58.3

As shown in Figure 2, clinician-assessed erythema (CEA) scores demonstrated a significant reduction, with the mean value decreasing from 3.00 at baseline to 0.69 two weeks after the final laser session ($p < 0.05$).

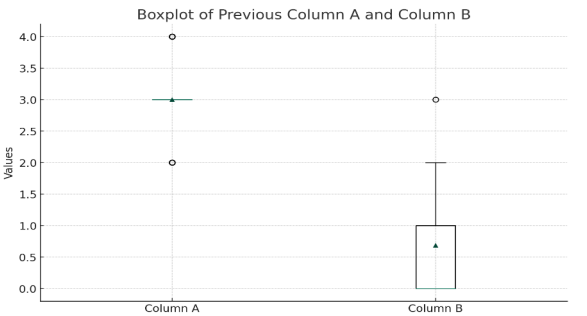

Figure 2: Mean erythema scale (CEA) of the patients at baseline and two weeks after the last treatment session.

Figure 3 illustrates a similar trend in patient-reported erythema (PSA) scores, which declined from 3.47 at baseline to 1.16 post-treatment ($p < 0.05$), indicating strong concordance between objective and subjective assessments.

Figure 4 shows that the mean Telangiectasia Area Involvement Score (TAIS) decreased from 3.05 to 2.08, suggesting mild improvement; however, this change did not reach statistical significance.

Figures 5 and 6 present representative clinical photographs of two patients, demonstrating visible reduction in diffuse facial erythema and partial clearance of telangiectatic vessels following three to four Nd:YAG laser sessions.

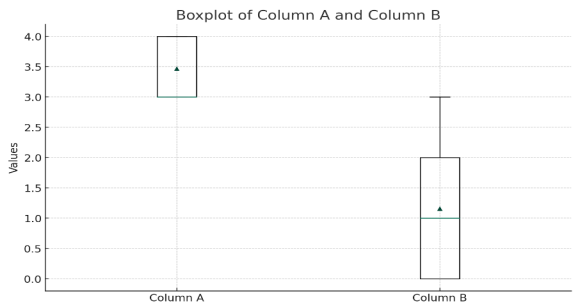

Figure 3: The mean score of patient's satisfactions about their erythema at baseline and two weeks after the last treatment session.

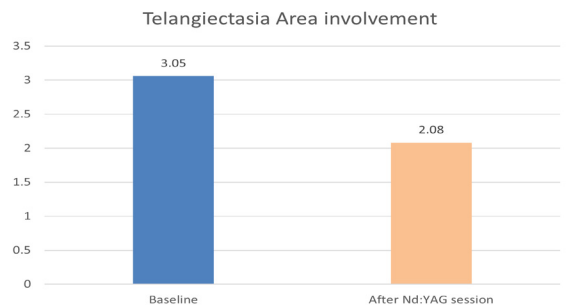

Figure 4: Mean score of telangiectasia area involvement of rosacea patients at baseline and two weeks after the last treatment session.

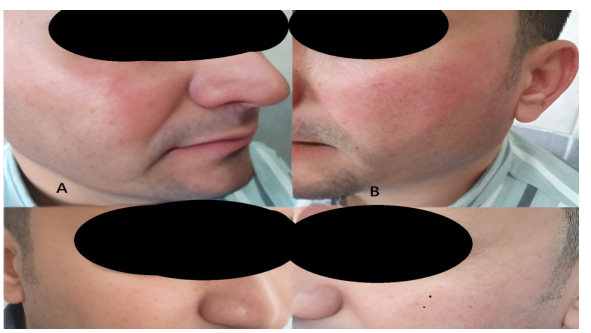

Figure 5: A 34 years old male with erythematotelangiectatic rosacea. A and B: Baseline visit. C and D: After 4 sessions of long pulse Nd:YAG laser treatment.

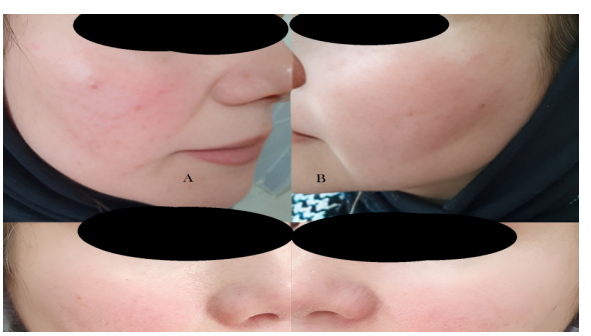

Figure 6: A 32 years old female with erythematotelangiectatic rosacea. A and B: Baseline visit. C and D: After 3 sessions of long pulse Nd:YAG laser treatment.

According to Table 3, the most common adverse event observed two weeks after the final session was mild transient erythema (59.4%), followed by mild itching (37.5%). Other adverse effects, including burning, stinging, and scaling, were infrequent and self-limiting. No severe or lasting complications, such as scarring, dyspigmentation, or blistering, were recorded. Overall, the treatment demonstrated favorable safety and tolerability, with statistically and clinically significant improvement in erythema severity.

Table 3: adverse effects after Nd:Yag laser session

Adverse effects	Two weeks after first session		Two weeks after last session		p Value
	No	%	No	%	
Scaling					
No scaling	30	93.7	30	93.7	0.232
Mild	2	6.3	2	6.3	
Moderate	0	0	0	0	
Severe	0	0	0	0	
Erythema					
No erythema	6	18.7	5	15.6	0.085
Mild	18	56.3	19	59.4	
Moderate	7	21.9	6	18.7	
Severe	1	3. 1	2	6.3	
Itching					
No itching	16	50.0	19	59.4	0.823
Mild	15	46.9	12	37.5	
Moderate	0	0	0	0	
Severe	1	3. 1	1	3. 1	
Burning sensation					
No burning	31	96.9	30	93.7	0.328
Mild	1	3.1	2	6.3	
Moderate	0	0	0	0	
Severe	0	0	0	0	
Stinging					
No stinging	31	96.9	30	93.7	0.427
Mild	1	3.1	1	3.1	
Moderate	0	0	1	3.1	
Severe	0	0	0	0	

DISCUSSION

The findings of this study indicate that the standardized long-pulse 1064 nm Nd:YAG laser protocol utilizing a 5 mm spot size, 4.07 J/cm^2 fluence, and 5 Hz frequency, resulted in significant improvement

in facial erythema among patients with erythematotelangiectatic rosacea and related vascular conditions. The mean Clinician's Erythema Assessment (CEA) score decreased from 3.00 to 0.69 ($p < 0.05$), while the Patient Self-Assessment (PSA) score improved from 3.47 to 1.16 ($p < 0.05$). These outcomes are comparable to those of Salem et al. (2023), who reported a 73% excellent response rate with Nd:YAG compared to 53% with pulsed dye laser (PDL), attributing the superior efficacy to the laser's deeper dermal penetration and reduced epidermal damage.[5] Similarly, Li and Wang demonstrated through a meta-analysis that Nd:YAG laser achieves equal or better erythema clearance than PDL, especially in patients with Fitzpatrick skin types III–IV, without causing purpura or necessitating downtime.[4]

In contrast, the reduction in telangiectasia was modest, with the mean Telangiectasia Area Involvement Score (TAIS) decreasing from 3.05 to 2.08. This finding is consistent with Kwon et al, who noted that although Nd:YAG effectively diminishes diffuse erythema, larger or resistant telangiectatic vessels often require higher fluence levels or combination treatments, such as adjunctive KTP laser, for optimal clearance.[6] The use of a conservative fluence (4.07 J/cm^2) in the present study, chosen to reduce the risk of adverse effects in participants with predominantly Fitzpatrick skin type III, likely contributed to the limited telangiectasia response. Future investigations could assess the safety and efficacy of incremental fluence adjustments or dual-wavelength techniques to optimize vascular clearance.

Adverse effects were mild, transient, and self-limiting. The most frequent reactions were temporary post-treatment erythema (59.4%) and mild itching (37.5%), comparable to the findings of Asiran Serdar and Fisek Izci in a similar patient population.[15] Importantly, no cases of dyspigmentation, scarring, or blistering were observed, supporting the safety of this laser protocol for medium-pigmented skin types.

A notable methodological strength of this study is the introduction of the Telangiectasia Area Involvement Score (TAIS), an anatomically weighted tool designed to quantify vascular involvement more precisely than traditional global scoring methods. Although external validation is still required, TAIS provides a more detailed and objective framework for assessing telangiectasia severity compared with previously used physician-based grading systems.[4, 5]

This study has several limitations that should be acknowledged. First, the sample size was relatively small ($n = 32$) and derived from a single dermatology teaching centre in Pakistan, which may restrict the generalizability of the results to wider populations, particularly those with different Fitzpatrick skin types or from varied geographic regions. Second, the lack of a control group or randomization prevents definitive conclusions regarding causality; although the observed improvements were statistically significant, they could partially reflect placebo effects or natural fluctuations in disease activity. Third, the assessment of telangiectasia was based on the newly developed Telangiectasia Area Involvement Score (TAIS), which, while anatomically detailed, has not yet undergone external validation or inter-observer reliability testing beyond the two dermatologists who participated in scoring. Fourth, the short follow-up period of two weeks after the final treatment session limits evaluation of long-term treatment durability and the possibility of delayed adverse reactions. Additionally, patient-reported outcomes were collected through face-to-face interviews instead of standardized self-administered or digital questionnaires, potentially introducing interviewer bias. Future multicentre randomized controlled trials with larger sample sizes, extended follow-up durations, validated vascular scoring instruments, and comparative laser modalities are recommended to further substantiate and expand upon these findings.

CONCLUSION

In this study we found out that using long pulse Nd:YAG 1064 nm laser in the following setting spot size: 5mm, fluence: 4.07 J/Cm2, energy: 800 mJ and frequency: 5 Hz is very effective in the treatment of erythema associated erythematotelangiectatic rosacea. Using this method of laser therapy can induce a good relieve of facial telangiectasia as well in both surface area involvement and intensity of it, but to a lesser extent than improvement of erythema. Generally, patients were very satisfied about results of the treatment method. The evidence of negligeable adverse effects after laser sessions of long pulse Nd:YAG laser in the mentioned setting is encouraging to use it safely for rosacea patients.

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CONFLICT OF INTEREST
Authors declare no conflict of interest.
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None declared.

AUTHORS' CONTRIBUTION

The following authors have made substantial contributions to the manuscript as under:

Conception or Design:	SAM, DSQ
Acquisition, Analysis or Interpretation of Data:	SAM, DSQ
Manuscript Writing & Approval:	SAM, DSQ

All the authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.