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Anxiety, patient satisfaction, and outcomes of intense pulsed light-based treatment for moderate-to-severe acne vulgaris in Southern Vietnam

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Abstract

Acne vulgaris is a common inflammatory disorder with psychosocial consequences. Data on anxiety and outcomes of intense pulsed light (IPL)-based therapy for moderate-to-severe acne remain limited in Vietnam. This study described clinical characteristics, anxiety burden, satisfaction, and treatment outcomes after IPL-based management. A single-center study was conducted at Can Tho Dermatology Hospital (Vietnam) from May 2023 to May 2024. A total of 220 patients aged ≥ 12 years with moderate-to-severe acne vulgaris were enrolled. Acne severity was evaluated using the Global Acne Grading System (GAGS), while anxiety was assessed using the anxiety subscale of the Depression Anxiety Stress Scales-21 (DASS-21). Thirty-six patients with anxiety underwent an 8-week IPL-based combination regimen. Clinical response, GAGS score, anxiety change, satisfaction, and tolerability were evaluated. The mean age was 21.8 ± 6.3 years, and 59.5% were female. Papulopustular acne was predominant (98.6%), and all patients had facial involvement. Post-inflammatory hyperpigmentation and atrophic scarring were present in 100.0% and 76.8%, respectively. Baseline anxiety was identified in 48.6% of patients. Severe acne was strongly associated with anxiety compared with moderate acne (odds ratio [OR]=24.64; 95% confidence interval [CI]: 7.32-127.43; $p < 0.001$). In the treatment subgroup, good clinical response increased from 36.1% at week 4 to 66.7% at week 8. Mean GAGS score decreased from 25.3 ± 3.8 to 12.7 ± 5.9 ($p < 0.001$), and treatment success reached 86.1%. Anxiety decreased from 100.0% to 30.6% after treatment ($p < 0.001$). Most patients were satisfied (86.1%), and adverse effects were mild. Moderate-to-severe acne was frequently associated with anxiety. An IPL-based regimen was associated with clinical improvement, reduced anxiety, high satisfaction, and good tolerability.

Introduction

Acne vulgaris is a common disorder of the pilosebaceous unit with a multifactorial pathogenesis involving genetic, hormonal, inflammatory, microbial, and psychological factors.¹ It affects individuals of all ages but is particularly prevalent among adolescents and young adults; approximately 85% of people aged 12-24 years are affected, and the disease may persist into adulthood. Clinically, 10-20% of patients may develop moderate-to-severe acne.^{1,2}

Although acne vulgaris is not life-threatening, its psychosocial impact is substantial and is often underestimated.³ Visible facial lesions, post-inflammatory hyperpigmentation, and acne scarring can negatively affect appearance, self-esteem, interpersonal relationships, daily activities, work, and emotional well-being.⁴ Acne has also been associated with anxiety, depression, impaired quality of life,

and other psychological disturbances.^{5,6} Therefore, effective and timely treatment is important not only to reduce inflammatory lesions and prevent physical sequelae, but also to minimize psychological burden.^{6,7} Conventional acne therapy is selected according to disease severity. Topical agents, particularly retinoids, are commonly used for mild acne because of their anti-inflammatory and comedolytic effects. However, topical retinoids may cause local adverse reactions such as erythema, peeling, dryness, burning, and pruritus, and some agents require caution in women of childbearing age because of teratogenic concerns.^{8,9} For moderate-to-severe acne, systemic therapies, including oral antibiotics, hormonal agents, anti-androgens, and isotretinoin, may be indicated.⁷ Nevertheless, systemic antibiotics may be limited by adverse effects and by the increasing concern of *Cutibacterium acnes* antimicrobial resistance, which may reduce treatment efficacy and contribute to broader patterns of antibiotic resistance in the community.^{8,10} In this context, physical and light-based therapies have gained increasing attention as adjunctive or alternative approaches in acne management. Intense pulsed light (IPL) is a broad-spectrum, high-intensity light source that has been shown to be relatively safe and well tolerated in the treatment of acne vulgaris.¹¹ IPL may improve inflammatory acne through photochemical effects on porphyrins produced by *C. acnes* and photothermal effects on vascular and sebaceous gland-related targets.¹² Previous studies have suggested that IPL, particularly when combined with topical or systemic therapies, may improve inflammatory lesions and clinical severity while producing few serious adverse effects.¹¹

Can Tho Dermatology Hospital is a major specialized dermatology center serving Can Tho City and neighboring provinces in the Mekong Delta region, Vietnam. Each year, the hospital receives and treats approximately 10,000 patients with acne vulgaris, of whom about 40% present with moderate or severe disease. However, systematic data on anxiety, patient satisfaction, and outcomes of IPL-based treatment among patients with moderate-to-severe acne vulgaris in this setting remain limited.

Therefore, this study was conducted to describe the clinical characteristics and anxiety burden of patients with moderate-to-severe acne vulgaris, and to evaluate patient satisfaction, clinical outcomes, anxiety improvement, and tolerability after IPL-based treatment at Can Tho Dermatology Hospital during 2023-2024.

Materials and Methods

Study design and setting

This was a single-center observational study consisting of a cross-sectional baseline assessment and a prospective 8-week treatment follow-up subgroup. The study was conducted at the Outpatient Department

of Can Tho Dermatology Hospital, Vietnam, from May 2023 to May 2024. The baseline component aimed to describe clinical characteristics and anxiety among patients with moderate-to-severe acne vulgaris. The treatment follow-up component evaluated clinical response, anxiety change, patient satisfaction, and tolerability among patients receiving an IPL-based treatment regimen.

Study population

Patients presenting to Can Tho Dermatology Hospital with clinically diagnosed acne vulgaris were screened for eligibility. Eligible patients were aged 12 years or older and had moderate or severe acne vulgaris according to the Global Acne Grading System (GAGS).¹³ Acne vulgaris was diagnosed clinically based on typical lesions, including comedones, papules, pustules, nodules, or cysts, distributed in seborrheic areas such as the face, chest, or back.¹⁴

Patients were included if they had moderate acne, defined as a GAGS score of 19-30, or severe acne, defined as a GAGS score of 31-38; had no malignant disease; wished to receive treatment; and agreed to participate in the study. For participants younger than 18 years, consent was obtained from both the patient and a parent or legal guardian. Exclusion criteria were pregnancy or lactation, a history of skin sensitivity to IPL, or current use of medications contraindicated with IPL treatment.

Acne severity assessment

Acne severity was assessed using GAGS. Six anatomical regions were evaluated: forehead, right cheek, left cheek, nose, chin, and chest/upper back. Each region was assigned an area factor, and the most severe lesion in each region was graded from 0 to 4: no lesion, comedone, papule, pustule, or nodule. The local score for each region was calculated by multiplying the area factor by the lesion grade, and the total GAGS score was obtained by summing all regional scores.

Severity was categorized as mild, 1-18 points; moderate, 19-30 points; severe, 31-38 points; and very severe, ≥ 39 points. Only patients with moderate or severe acne at baseline were included in the study.

Anxiety assessment

Anxiety was assessed using the anxiety subscale of the Depression Anxiety Stress Scale-21 (DASS-21), which has been used in Vietnam and was selected because of its feasibility for clinical screening.¹⁵ The anxiety subscale consists of seven items: B1, B3, B5, B6, B9, B12, and B13. Each item was scored from 0 to 3, and the sum of the seven items was multiplied by 2 to obtain the final anxiety score.

Anxiety was defined as a DASS-21 anxiety score of ≥ 8 . Anxiety severity was classified as normal, 0-7 points; mild, 8-9 points; moderate, 10-14 points; severe, 15-19 points; and extremely severe, 20-42 points. Anxiety was assessed at baseline in the full study population and reassessed after 8 weeks in the IPL-treated subgroup.

IPL-based treatment protocol

Patients in the treatment subgroup received an IPL-based regimen for 8 weeks. IPL treatment was performed according to the technical procedure for acne treatment issued by the hospital. The device used was an IPL MED system manufactured by EME S.r.l., Pesaro e Urbino, Italy. The device specifications included a power output of 3,000 W, a spot size of 10×40 mm, and a frequency of 1 Hz. The treatment wavelength was 420 nm, and the energy fluence was 9 J/cm².

Before treatment, patients were counseled regarding the procedure and possible adverse effects. Cosmetic products were removed from the treatment area, cooling gel was applied, and eye protection was used for both patients and staff. The IPL handpiece was placed parallel to the skin surface with gentle contact, avoiding overlap between treatment areas. Cold gauze was applied after irradiation when needed, and patients were monitored for pain, swelling, erythema, or thermal injury. Patients were instructed to avoid sun exposure and to avoid cosmetic products for 24 hours after treatment.

IPL was used as part of a real-world combination treatment approach rather than as monotherapy. Concomitant systemic antibiotics, topical medications, and supportive cosmetic products were prescribed at the discretion of the treating physicians according to clinical severity and routine hospital practice. These concomitant treatments were recorded but were not analyzed as independent interventions in the present manuscript.

Clinical outcome assessment

Clinical response was evaluated at week 4 and week 8. Response was classified into four categories: good, fair, moderate, and poor. A good response was defined as disappearance of pustules, resolution of oily skin, $\geq 90\%$ reduction in inflammatory papules, absence of pruritus, and resolution of erythema. A fair response was defined as persistence of some pustules, marked reduction in oiliness, 60-89% reduction in inflammatory papules, absence of pruritus, and reduced erythema. A moderate response was defined as persistent pustules, mild reduction in oiliness, 20-59% reduction in inflammatory papules, mild pruritus,

and persistent erythema. A poor response was defined as persistent pustules, minimal reduction in oiliness, <20% reduction or no reduction in inflammatory papules, persistent pruritus, and persistent erythema.^{16,17} Treatment success was evaluated at week 8 and defined as acne clearance or improvement in GAGS severity category compared with baseline. Patients whose GAGS severity category remained unchanged or worsened were classified as not achieving treatment success.

Patient satisfaction assessment

Patient satisfaction was assessed at the end of the 8-week treatment period using three items adapted from the Vietnamese Ministry of Health patient satisfaction questionnaire, focusing on treatment-related service outcomes. The three domains were: satisfaction with examination and treatment outcomes; satisfaction with invoices, receipts, prescriptions, medical documents, and transparency of information; and confidence in the quality of medical services.

Each item was rated using a 5-point Likert scale: 1, very dissatisfied; 2, dissatisfied; 3, neutral; 4, satisfied; and 5, very satisfied. For analysis, satisfaction was summarized as the proportion of patients reporting “satisfied” or “very satisfied” for each domain.

Safety and tolerability assessment

Tolerability was assessed during IPL sessions. Patient-reported pain and heat sensation were evaluated using a visual analogue scale and categorized as none, mild, moderate, severe, very severe, or unbearable. For the present analysis, symptoms were summarized as no symptoms, mild symptoms, or moderate-to-severe symptoms.

Erythema after IPL was assessed using the Investigator’s Global Assessment (IGA) Scale, with scores categorized as 0, no erythema; 1, mild erythema; 2, moderate erythema; and 3, severe erythema, edema, or hyperpigmentation.¹⁷ Adverse effects were monitored throughout the treatment course.

Statistical analysis

Data were coded and analyzed using Stata version 15.0. Microsoft Excel 2013 was used to prepare tables and charts. Categorical variables were summarized as frequencies and percentages. Continuous variables were summarized as mean $\pm$ standard deviation when normally distributed, and as median and interquartile range when not normally distributed.

Comparisons of paired continuous variables before and after treatment were performed using the paired Student's *t*-test for normally distributed data or the Wilcoxon signed-rank test for non-normally distributed data. Paired binary outcomes were analyzed using McNemar's test or exact McNemar's test. Paired ordinal outcomes were analyzed using the Wilcoxon signed-rank test. Univariable logistic regression was used to estimate odds ratios (ORs) and 95% confidence intervals (CIs) for factors associated with baseline anxiety.

Ethical considerations

The study was reviewed and approved by the Biomedical Research Ethics Committee of Can Tho University of Medicine and Pharmacy, approval No. 23.190.HV/PCT-HĐĐĐ, dated March 20, 2023.

Results

Study population and baseline clinical characteristics

A total of 220 patients with moderate-to-severe acne vulgaris were included. The mean age was 21.8 ± 6.3 years, ranging from 12 to 46 years. More than half of the patients were aged 18-25 years (52.3%), followed by those aged 12-<18 years (25.5%) and >25 years (22.3%). Female patients accounted for 59.5% of the study population.

Acne most commonly began during adolescence. The age of onset was 12-<18 years in 47.7% of patients and 18-25 years in 37.3%, whereas only 15.0% reported onset after 25 years of age. Oily skin was the predominant skin type, observed in 168 patients (76.4%), while combination skin was present in 52 patients (23.6%). Papulopustular acne was the most frequent clinical pattern (217/220, 98.6%), followed by comedonal acne (176/220, 80.0%) and nodulocystic acne (81/220, 36.8%). All patients had facial involvement; 37.3% also had lesions on the chest or back, and 39.6% had acne affecting multiple anatomical sites. Post-inflammatory hyperpigmentation was present in all patients, and atrophic scarring was observed in 76.8%.

At baseline, most patients had moderate acne according to the GAGS. Moderate acne was recorded in 174 patients (79.1%), while severe acne was observed in 46 patients (20.9%). The mean baseline GAGS score was 25.0 ± 4.6 , with a range of 19-36.

Baseline anxiety and associated factors

Before treatment, 107 of 220 patients (48.6%) had anxiety according to the DASS-21 anxiety subscale. The mean anxiety score was 7.1 ± 4.3 . Among all patients, 50 (22.7%) had mild anxiety, 39 (17.7%) had moderate anxiety, and 18 (8.2%) had severe anxiety. No patient had extremely severe anxiety.

Acne severity was strongly associated with anxiety. Anxiety was present in 43 of 46 patients with severe acne (93.5%), compared with 64 of 174 patients with moderate acne (36.8%). In univariable analysis, severe acne was associated with markedly higher odds of anxiety than moderate acne (OR=24.64; 95% CI: 7.32-127.43; $p < 0.001$) (Table 1). Other demographic variables, including age group, sex, educational level, and chronic comorbidity, were not significantly associated with anxiety.

Characteristics of patients receiving IPL-based treatment

Among the 220 enrolled patients, 36 patients with anxiety underwent an 8-week IPL-based treatment course. The mean age in this treatment subgroup was 21.1 ± 4.3 years, ranging from 14 to 30 years. Most patients were aged 18-25 years (58.3%), followed by 12-<18 years (27.8%) and >25 years (13.9%). At baseline, 32 patients (88.9%) had moderate acne and 4 patients (11.1%) had severe acne. Most patients received concomitant systemic and/or topical acne therapy during the IPL-based treatment course.

Clinical response after IPL-based treatment

Clinical improvement increased over time (Table 2). At week 4, 13 patients (36.1%) achieved a good clinical response and 17 patients (47.2%) achieved a fair response. By week 8, the proportion of patients with a good response increased to 24 patients (66.7%), while 10 patients (27.8%) had a fair response and two patients (5.5%) had a moderate response. No patient had a poor response at week 8. The improvement in clinical response distribution from week 4 to week 8 was statistically significant.

GAGS severity also improved substantially after 8 weeks of treatment (Table 3). At baseline, all 36 treated patients had moderate or severe acne. After treatment, 31 patients (86.1%) improved to mild acne and five patients (13.9%) remained in the moderate category; no patient had severe or very severe acne at week 8. The mean GAGS score decreased from 25.3 ± 3.8 at baseline to 12.7 ± 5.9 after 8 weeks ($p < 0.001$). Overall treatment success, defined as acne clearance or improvement in GAGS severity category, was achieved in 31 of 36 patients (86.1%).

Among patients with moderate acne at baseline, 27 of 32 (84.4%) improved to mild acne after treatment. All four patients with severe acne at baseline improved to mild acne by week 8. Five patients (13.9%) remained in the moderate category after treatment.

Change in anxiety after treatment

Anxiety improved in parallel with clinical improvement (Table 4). Before IPL-based treatment, all 36 treated patients had anxiety. After 8 weeks, 25 patients (69.4%) no longer met the DASS-21 threshold for anxiety, while 11 patients (30.6%) still had anxiety. The proportion of patients with anxiety decreased significantly from 100.0% to 30.6% ($p<0.001$). The mean anxiety score also decreased significantly, from 9.5 ± 3.0 before treatment to 6.3 ± 2.4 after treatment ($p<0.001$).

A shift toward lower anxiety severity was observed after treatment. At baseline, 17 patients (47.2%) had mild anxiety, 16 (44.5%) had moderate anxiety, and three (8.3%) had severe anxiety. After treatment, 25 patients (69.4%) were classified as normal, 10 (27.8%) had mild anxiety, and only one patient (2.8%) had moderate anxiety. No patient had severe anxiety after treatment.

Patient satisfaction

Patient-reported satisfaction after treatment was generally high. Regarding treatment outcomes, 31 of 36 patients (86.1%) were satisfied or very satisfied, including 27 patients (75.0%) who were satisfied and four patients (11.1%) who were very satisfied. Satisfaction with invoices, prescriptions, medical documents, and transparency of service information was reported by 24 patients (66.7%). Confidence in the quality of medical services was reported by 29 patients (80.6%). No patient reported being dissatisfied or very dissatisfied in any of the assessed domains.

Tolerability and adverse effects

IPL-based treatment was well tolerated. At the third session, tolerability data were available for 35 patients. Most patients reported no pain during treatment: 77.8% at the first session, 77.8% at the second session, and 85.7% at the third session. Mild pain was reported by 22.2%, 22.2%, and 14.3% of patients at the corresponding sessions, respectively. No patient reported moderate or severe pain. Similarly, most patients reported no heat sensation during IPL, and no moderate or severe heat sensation was recorded. Mild erythema was the most common local reaction and decreased over time. It was observed in 10 patients (27.8%) at the first session, nine patients (25.0%) at the second session, and four patients (11.4%)

at the third session. No patient developed moderate or severe erythema, edema, hyperpigmentation, or other serious adverse effects during the treatment course.

Discussion

This study highlights the psychological burden of moderate-to-severe acne vulgaris and the potential clinical value of an IPL-based treatment regimen in a dermatology hospital setting in the Mekong Delta region of Vietnam. A major finding was the high prevalence of anxiety among patients with moderate-to-severe acne. Before treatment, 48.6% of patients had anxiety according to the DASS-21 anxiety subscale. This confirms that acne should not be considered merely a cosmetic condition, as visible facial lesions, pigmentation, and scarring may negatively affect self-image, social interaction, and quality of life.^{5,18} Noor *et al.* reported a higher anxiety prevalence of 84.1% among patients with moderate-to-severe acne.¹⁹ Differences between studies may be related to population characteristics, cultural context, clinical severity, and psychological assessment methods.

After 8 weeks of IPL-based treatment, clinical improvement was substantial. The proportion of patients with good clinical response increased from 36.1% at week 4 to 66.7% at week 8, and no patient had a poor response at the end of treatment. The mean GAGS score decreased significantly, and 86.1% of patients achieved treatment success. Our findings are consistent with previous evidence supporting IPL as a useful modality for inflammatory acne. Qu *et al.* reported that IPL combined with minocycline produced greater improvement in inflammatory lesions and IGA scores than minocycline alone,²⁰ while Kumaresan *et al.* showed that IPL improved acne severity, particularly when combined with topical or systemic agents.²¹ The therapeutic effect of IPL in acne may be explained by both photochemical and photothermal mechanisms. IPL can activate porphyrins produced by *C. acnes*, generating reactive oxygen species that damage the bacteria. It may also reduce sebaceous gland activity through selective photothermolysis of vascular structures supplying the pilosebaceous unit.²² However, in this study, IPL was used as part of a combination regimen with systemic antibiotics, topical medications, and supportive skincare. Therefore, the observed clinical benefit should be interpreted as the effect of an IPL-based combined approach rather than IPL monotherapy.

Anxiety also improved after treatment. Among the 36 treated patients, all had anxiety at baseline, whereas only 30.6% remained anxious after 8 weeks. The mean anxiety score decreased significantly, and no patient had severe anxiety after treatment. This improvement likely reflects the close relationship between

visible acne improvement and psychological well-being. Nevertheless, because this was not a controlled study, the reduction in anxiety cannot be attributed solely to IPL.

Patient satisfaction was favorable. Most patients were satisfied or very satisfied with treatment outcomes, and confidence in service quality was high. The relatively lower satisfaction with invoices, documentation, and transparency suggests that administrative aspects of care could be further improved even when clinical outcomes are good.

The IPL-based regimen was well tolerated. Most patients reported no pain or heat sensation, and no moderate or severe pain, heat, erythema, edema, hyperpigmentation, or serious adverse effects were recorded. Mild erythema was the most common local reaction and decreased over time. This safety profile is consistent with previous reports describing IPL as a relatively safe physical modality for acne treatment.^{11,17}

This study has several limitations. The treatment subgroup was small and lacked a control group. IPL was combined with other acne treatments, making it impossible to determine the independent effect of IPL. Anxiety was assessed using the DASS-21 anxiety subscale as a screening tool rather than a psychiatric diagnostic interview. Finally, follow-up lasted only 8 weeks, so long-term relapse, durability of psychological improvement, and delayed adverse effects could not be assessed.

While this study confirms the established association between acne and emotional distress by demonstrating a significant reduction in anxiety following treatment, future work should evaluate a broader range of psychological aspects both before and after intervention. As noted by Féton-Danou (2010), the clinical severity of acne does not always correspond directly to the degree of emotional distress experienced by the patient.²³ Rather, this distress is strongly linked to body image perception and the potential presence of depressive factors. Consequently, assessing these additional emotional dimensions in future cohorts would provide a more comprehensive understanding of the psychosocial impact of acne therapies.

Conclusions

In summary, moderate-to-severe acne was frequently associated with anxiety. An 8-week IPL-based combination regimen was associated with significant clinical improvement, reduced anxiety, high patient satisfaction, and good tolerability. Larger controlled studies with longer follow-up are needed to clarify the independent and long-term effects of IPL in acne management.

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Table 1. Association between acne severity and anxiety before treatment.

Acne severity by GAGS	Anxiety present n (%)	Anxiety absent n (%)	OR	95% CI	p-value
Severe acne	43 (93.5)	3 (6.5)	24.64	7.32-127.43	<0.001 ^a
Moderate acne (reference group)	64 (36.8)	110 (63.2)			
Total	107 (48.6)	113 (51.4)			

GAGS, Global Acne Grading System; CI, confidence interval; OR, odds ratio; ^aFisher's exact test.

Table 2. Clinical response after IPL-based treatment.

Clinical response	Week 4 n (%)	Week 8 n (%)	p-value
Good	13 (36.1)	24 (66.7)	0.048 ^a
Fair	17 (47.2)	10 (27.8)	
Moderate	4 (11.1)	2 (5.5)	
Poor	2 (5.6)	0 (0.0)	
Total	36 (100.0)	36 (100.0)	

^aWilcoxon signed-rank test.

Table 3. Change in acne severity after IPL-based treatment.

Acne severity by GAGS	Baseline n (%)	Week 8 n (%)	p-value
Mild, 1-18 points	0 (0.0)	31 (86.1)	<0.001 ^a
Moderate, 19-30 points	32 (88.9)	5 (13.9)	
Severe, 31-38 points	4 (11.1)	0 (0.0)	
Very severe, ≥39 points	0 (0.0)	0 (0.0)	
Total	36 (100.0)	36 (100.0)	
GAGS score, mean ± SD	25.3±3.8	12.7±5.9	<0.001 ^b

GAGS, Global Acne Grading System; SD, standard deviation; ^aWilcoxon signed-rank test; ^bpaired *t*-test.

Table 4. Change in anxiety after IPL-based treatment.

Anxiety status/score	Baseline n (%)	Week 8 n (%)	p-value
Anxiety present, ≥8 points	36 (100.0)	11 (30.6)	<0.001 ^a
Anxiety absent, <8 points	0 (0.0)	25 (69.4)	
Anxiety score, mean ± SD	9.5±3.0	6.3±2.4	<0.001 ^b

SD, standard deviation; ^aMcNemar's test; ^bpaired *t*-test.