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EVALUATION OF THE THERAPEUTIC SUPPORT EFFECTS OF LIGHT THERAPY FOR PATIENTS WITH SEVERE ACNE VULGARIS

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ABSTRACT

Purpose: *To evaluate the treatment results of combined blue light (415 nm wavelength) and red light (633 nm wavelength) therapy for patients with severe acne vulgaris.*

Subjects and methods: *A pre-post comparative interventional study on 30 patients with severe acne vulgaris, examined and treated at the National Hospital of Dermatology and Venereology from July 2022 to June, 2023.*

Results: *The female-to-male patient ratio was approximately 2.3/1. Patients aged 16-25 accounted for 70.8%, and 46.7% had family members with acne. Clinically, 100% of patients had facial lesions (with 97.8% of lesions in the cheek area). The number of inflammatory and non-inflammatory lesions gradually decreased from week four to week 12 of treatment. The differences between treatment weeks and pre-treatment were statistically significant, with $p < 0.05$. Good and very good treatment results increased for both genders after four, eight, and 12 weeks of the treatment, with statistically significant changes ($p_{1-2} < 0.05$ and $p_{3-1} < 0.05$). Dry lips remained a common unwanted effect at the end of treatment (60.0%).*

Conclusions: *Treatment of severe acne vulgaris with isotretinoin combined with blue light and red light had a good treatment effect after 12 weeks of treatment.*

Keywords: Red light, blue light, acne vulgaris.

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1. INTRODUCTIONS

Acne is a common dermatological disease that typically emerges during adolescence and can progress chronically over many years. In Vietnam, many studies on acne have indicated that the most affected age group is between 15 and 24 years old, constituting approximately 70% of cases. According to statistics from the National Hospital of Dermatology and Venereology in 2013, acne accounted for 14.61% of dermatological consultations, ranking second only to atopic dermatitis [1]. An epidemiological study on acne by Dunn in 2011 concluded that acne negatively impacts the quality of life, and increases the risk of depression, and suicidal tendencies [6]. Therefore, the effective treatment of acne, especially severe acne vulgaris, remains a primary concern in dermatology.

Various regimens and treatment guidelines for severe common acne (acne vulgaris) were employed globally, with a predominant focus on antibiotics, retinoids, isotretinoin, and benzoyl peroxide, among other medications. Isotretinoin, in particular, is the sole medication affecting all four pathogenic mechanisms of severe acne vulgaris (increased sebum production, follicular keratinization, the role of C. acnes bacteria, and the involvement of inflammatory factors). However, isotretinoin is associated with several unwanted effects such as dry skin, chapped lips, redness, peeling, and notably, the potential to cause birth defects, rendering it unsuitable for pregnant and breastfeeding women. Light therapy has also been applied in the treatment of various dermatological diseases (including severe acne vulgaris), offering advantages such as not causing bleeding, not causing pain to the patients, easy of implementation, and cost-effectiveness. In Vietnam, many medical facilities have used light

therapy for acne patients, but there have not been many studies to evaluate it.

We conducted this study to evaluate the therapeutic support effects of combined blue light (415 nm wavelength) and red light (633 nm wavelength) for patients with severe acne vulgaris at National hospital of Dermatology and Venereology.

2. SUBJECTS AND METHODS

2.1. Subjects

Thirty patients diagnosed with severe acne vulgaris (according to M.C. Coy, 2008) were selected for examination and treatment at the National hospital of Dermatology and Venereology from July 2022 to June 2023.

- Inclusion criteria: patients aged 16 and older, regardless of gender; patients completed the treatment regimen and agreed to participate in the study.

- Exclusion criteria: Patients underwent laser intervention within 12 weeks before participating in the study; patients sensitive to light, with a history of hypertrophic scars or currently suffering from Herpes simplex in the treatment area; pregnant women.

2.2. Methods

- Study design: pre-post comparative intervention.

- Diagnosis of severe acne vulgaris according to Karen McCoy (> 5 cysts/nodules, or > 100 non-inflammatory lesions, or > 50 inflammatory lesions, or total lesions > 125).

- Sample size: convenience sampling.

- Treatment regimen:

+ Isotretinoin: branded drug Bomitis 20 mg, dosage 1 capsule/day, taken at night, after a full meal.

+ Facial cleanser: Tenamyd - acne care Clarifying foam cleanser 120g: create foam on the palm and then apply to the face in the morning and evening.

+ Bexinclin acne cream: apply a thin layer to the affected area after washing the face in the evening, avoiding excessive stickiness.

+ Farmona-Dermacos Anti-acne Matting cream 50 ml: apply a thin layer to the entire face, avoiding excessive stickiness.

+ Combined light therapy: Dermalux Triwave LED 3-color therapy system, manufactured by Aesthetic Technology Ltd., UK.

- Perform the procedure: wash the face, extraction of comedones, wearing eye protection glasses for patients, selection of treatment program:

+ Blue light (415 nm wavelength) combined with red light (633 nm wavelength): light exposure time 20 minutes; distance from LED lights to the treated area is 4-8 cm.

+ Light therapy sessions were repeated every 1 week/1 session, with a total of 5 sessions.

- Evaluation of results after four weeks,eight weeks, and 12 weeks of treatment (based on the improvement rate of skin lesions), calculated using the formula:

$$\text{Improvement rate of skin lesions} = \frac{\text{(Pretreatment lesion count) - (Posttreatment lesion count)}}{\text{Pretreatment lesion count}} \times 100\%$$

- Evaluation of treatment results:

Treatment results	Effectiveness	Total lesion reduction rate
Very good	Completely recovered	95-100%
	Almost fully recovered	90 to less than 95%
Good	Marked improvement	60 to less than 90%
Average	Moderate improvement	30 to less than 60%
Poor	Slight improvement	10 to less than 30%
	No change	<10%
	Worse	< 0% and/or experiencing severe adverse effects

- Research ethics: the research regimen has been approved by the hospital's ethics committee. Patients were thoroughly informed about the study, and agreed to participate in the study.

- Data processing: data were processed using SPSS 20.0 software. Variables were presented as means, standard deviations, minimum and maximum values, percentages, and frequencies. Statistical tests used for comparing two means included the t-test for normally distributed variables, non-parametric tests (Mann-Whitney U) for non-normally distributed variables. The $\chi 2$ test was employed to compare two proportions.

Pearson's test used to examine the correlation between two quantitative variables, or ANOVA test for comparisons involving three or more quantitative variables. The difference was statistically significant when $p < 0.05$.

3. RESULTS

3.1. General information about study subjects

Table 1. General information about study patients (n = 30)

General information		No. of patients	Percentage (%)
Ages	16-20 years old	10	33.3
	21-25 years old	11	37.5
	26-30 years old	5	15.8
	31-35 years old	3	10.0
	Over 35 years old	1	3.4
Gender	Male	9	30.0
	Female	21	70.0
Family history	Yes	14	46.7
	No	16	53.3

Female patients (70.0%) more than male patients (30.0%). The majority of patients were in the 21-25 age group (37.5%), and patients have a family history of having a member with acne (46.7%).

Table 2. Distribution of patients by lesion location (n = 30)

Lesion location	No. of patients	Percentage (%)
Forehead	9	30.0
Nose/Chin	2	6.6
Cheeks	13	43.3
Scattered across face	17	56.6

Most patients exhibited lesions on the cheeks and scattered across the face (43.3% and 56.6%, respectively). Forehead lesions accounted for a lower percentage (30.0%), and the lowest percentage was observed in the nose/chin area (6.6%).

3.2. Treatment results

Table 3. Treatment progress (n = 30)

Number of lesions	Type of lesions		p
	Inflammatory	Noninflammatory	
Week 0	23.1 ± 9.8	22.0 ± 8.5	< 0.05
Week 4	12.9 ± 7.0	14.7 ± 6.2	
Week 8	8.2 ± 4.8	11.3 ± 5.8	
Week 12	5.0 ± 3.7	7.9 ± 5.3	

The number of inflammatory and non-inflammatory lesions decreased progressively from week four to week 12 of treatment. The differences between treatment weeks were statistically significant, with $p < 0.05$.

Table 4. Treatment results by Evaluation Level

Treatment results	Week			p
	4(1)	8(2)	12(3)	
Very good	0	8 (26.7%)	16 (53.3%)	$p_{1-2} < 0.05$; $p_{2-3} > 0.05$; $p_{3-1} < 0.05$
Good	4 (13.3%)	22 (73.3%)	14 (46.7%)	
Average	23 (76.7%)	0	0	
Poor	3 (10.0%)	0	0	
Total	30 (100%)	30 (100%)	30 (100%)	

After four weeks of treatment, 13.3% of patients achieved good results, 87.2% achieved average results, and no patient responded good results. After eight weeks of treatment, 26.7% achieved very good results, 73.3% achieved good results. After 12 weeks of treatment, 53.3% achieved very good results, and 46.7% achieved good results. Treatment results improved progressively in both genders after four, eight, and 12 weeks of treatment. The changes were statistically significant with $p_{1-2} < 0.05$ and $p_{3-1} < 0.05$.

Table 5. Unwanted effects

Side effect	Week 4	Week 8	Week 12
Pain	2 (6.7%)	1 (3.3%)	0
Scaling	0	0	0
Pigmentation changes	0	0	0
Swelling	2 (6.7%)	0	0
Redness	2 (6.7%)	0	0
Dry lips	30 (100%)	22 (73,3%)	18 (60,0%)

All patients experienced the unwanted effect of dry lips at week four, which gradually decreased at weeks eight and 12 (73.3% and 60.0%, respectively). Pain, swelling, and redness were unwanted effects observed in some patients during the initial LED light treatment; however, these symptoms gradually diminished after treatment at weeks eight and 12 (most patients no longer experienced these unwanted effects).

4. DISCUSSIONS

Our study revealed that the majority of patients werin the age group of 16-25 years (70.8%), aligning with the typical characteristic for severe acne vulgaris patients, particularly in the younger population [7].

This can be attributed to the heightened hormonal activity during the developmental phase, with androgens playing a crucial role in stimulating sebaceous gland enlargement and activity, creating a favorable environment for acne formation. The age range of 15-24 comprises mostly students and office workers. These were all subjects with many social relationships and need to take care of their appearance more attention.

Among the 30 patients with severe acne vulgaris studied, 70.0% were female patients, and 30.0% were male patients, resulting in a female-to-male ratio of approximately 2.3/1. This gender distribution aligns with various domestic studies, such as those by Nguyen Thi Ngoc, 2013 (female/male patient ratio = 3/1) [4], and Tran Van Thao 2014 (female/male patient ratio = 4/1) [5], indicating a higher prevalence of females seeking treatment for severe acne vulgaris [5]. According to Nguyen Canh Cau and Nguyen Khac Vien (2001), the rate of severe acne vulgaris in males and females patients was equally during puberty and youth. The gender ratio difference observed in our study may be attributed to the greater impact of severe acne vulgaris on the aesthetic, psychological, and self-confidence aspects of females' lives.

Approximately 46.7% of patients had a family member history of acne. The results of this study were consistent with other domestic and foreign studies. In Vietnam, the study of Tran Van Thao in 2014 reported that family factors accounted for 49% of acne cases [5]. The study of Pham Van Hien indicated that if parents or one of them had a history of acne, the rate of their son having acne was 45%, if father and mother did not have acne, the rate of their son having acne was 8%. Additionally, people with severe and persistent acne often had a family history.

According to Vu Van Tien's research in 2002, 96.61% of research subjects had facial lesions, of which the cheek area accounted for 94.74%. These figures according to Hoang Ngoc Ha (2006) were 100% and 94.1% respectively; Nguyen Thi Minh Hong (2008) was 100% and 98.6% respectively [2]; Tran Van Thao (2014) were 100% and 88.5% respectively; Duong Thi Lan (2018) were 100% and 98.3% respectively. Thus, our results were equivalent to the above studies. This was explained because the number of sebaceous glands was distributed differently in each area of the body, in which the face was one of the areas with the highest density of sebaceous glands in the body (400-900 glands/cm^2 of skin) where sebaceous glands were most active (5 times more than other areas) [3].

Regarding the effectiveness of light therapy, after four weeks of treatment: 13.3% of patients achieved good results, 87.2% achieved average results, and no patient responded very good results. After eight weeks of treatment, 26.7% achieved very good results, 73.3% achieved good results. After 12 weeks of treatment, 53.3% achieved very good results, and 46.7% achieved good results, no case had average or bad results.

According to Goldberg et al (2006) [8], the combination of blue laser (wavelength 415 nm) and red laser (wavelength 633 nm) with exposure time of 20 minutes each time/each type of laser, two times/week, then after four weeks, acne lesions were reduced by 46%, after 12 weeks they were reduced by 81%, and the milder the disease, the better the results. According to Na et al (2007) [9], results of treating 38 patients with severe acne with single red light (wavelength 630 nm) on one side of the face twice a day, 15 minutes each time, for eight weeks, showed that the lesions was significantly reduced compared to the control side. The difference was statistically significant with $p < 0.05$. According to Nguyen Thi Ngoc (2013), the results of severe acne treatment with Klenzit C and Azithromycin, after four weeks, the response was average at 61.3%, poor at 39.7%; After eight weeks, the response was good at 45.2%, average at 51.6%, and very good at 3.2% [4].

Our study found that the number of inflammatory and non-inflammatory lesions gradually decreased through treatment milestones from week four to week eight and week 12. The difference between treatment weeks was statistically significant, with $p < 0.05$.

The evaluation time was conducted every four weeks, but when conducting research, we recorded parameters on the number of types of lesions each time of the treatment patients. Monitoring these data, we observed lesion reduction not just from week four, but even after two weeks of treatment initiation. . According to Tahra M Leheta, the reduction in the number of acne lesions after treatment continued for 4.5-5 months. This can be considered a superior advantage of pulsed color laser and can be explained by immune stimulation in the treated skin area [10].

Seaton and colleagues studied on 41 patients with moderate and mild facial acne, who treated by pulsed color laser for 12 weeks. The results showed that the total number of lesions decreased by 53% and the number of inflammatory lesions decreased

by 49%, of which, the fastest reduction in lesions was in the first four weeks.

The authors concluded that pulsed color laser was an effective and well-tolerated option in treatment of acne vulgaris, especially inflammatory lesions. The rapid reduction of lesions was the advantage of pulsed color laser when compared to conventional acne treatment with oral antibiotics (6-8 weeks before seeing results) [11]. Pulsed color laser caused biological effects in the affected tissue, leading to cell activation, especially T cells, releasing anti-inflammatory substances, increasing TGF-B1 and limiting comedone formation [10].

Unwanted effects: 100% of patients experienced dry lips at week four, this symptom gradually decreased at week eight (to 73.35%) and week 12 (to 60.0%). Undesirable effects were primarily limited to dry lips, experienced by 100% of patients at week 4, decreasing to 73.3% at week eight and 60.0% at week 12. Pain, swelling, and redness were initial symptoms observed in some patients during the first LED light treatment (all at 6.7%). However, these symptoms gradually diminished after the 8th and 12th weeks of treatment, with most patients no longer experiencing these adverse effects. Patients treated with laser in a study by Choi and colleagues in Korea also had similar results. Our research results were similar to those of Harto A [12], and Choi et al [13].

5. CONCLUSIONS

Study on 30 patients diagnosed with severe acne vulgaris, examined and treated at the National hospital of Dermatology and Venereology, concluded:

- The majority of patients were in the age range of 16-25 years (70.8%). The female-to-male ratio was approximately 2.3/1. About 46.7% of patients had a family member with a history of acne. All patients (100%) presented with facial lesions, with 97.8% having lesions on the cheek area.

- The number of inflammatory and non-inflammatory lesions gradually decreased from week four to week eight and week 12 of treatment. The differences between treatment weeks and the pre-treatment period were statistically significant, with $p < 0.05$.

- After four weeks of treatment, 13.3% of patients showed good results, while 87.2% showed average results. After eight week of treatment, 26.7% had very good results, and 73.3% had good results. After 12 weeks, 53.3% achieved very good results, and 46.7% had good results. The improvement in treatment results was observed in both male and female patients after four, eight, and 12 weeks of treatment, with statistically significant changes ($p_{1-2} < 0.05$ and $p_{3-1} < 0.05$).

- At the end of treatment, dry lips were a common unwanted effect, accounted for 60.0%.

REFERENCES

1. Tran Van Thao (2014), "The supportive treatment effectiveness of Papulex in ordinary acne at the Central Dermatology Hospital," *Master's Thesis*, Hanoi Medical University.
2. Duong Thi Lan (2009), "A study on the impact of common acne on the quality of life of patients," *Master's Thesis*, Military Medical Academy.
3. Nguyen Van Thuong (2017), "Dermatology: Acne", *Medical Publishing House*, Volume 3, p. 24.
4. Nguyen Thi Ngoc (2013), "Effectiveness of Klenzit-C cream in the treatment of common acne", Medical Master's Thesis, Hanoi Medical University.
5. Tran Van Thao (2014), "The supportive treatment effectiveness of Papulex in ordinary acne at the Central Dermatology Hospital, *Medical Master's Thesis*, Hanoi Medical University.
6. Bhate K. & Williams H.C (2013), "Epidemiology of acne vulgaris", *Br. J. Dermatol*, 168, 474-485.
7. Zeichner J.A et al (2017), "Emerging Issues in Adult Female Acne", *J. Clin. Aesthetic Dermatol*, 10, 37-46.
8. Goldberg D.J. & Russell B.A (2006), "Combination blue (415 nm) and red (633 nm) LED phototherapy in the treatment of mild to severe acne vulgaris", *J. Cosmet. Laser Ther*, Off. Publ. Eur. Soc. Laser Dermatol, 8, 71-75.
9. Na J.I. & Suh D.H (2007), "Red light phototherapy alone is effective for acne vulgaris: randomized, single-blinded clinical trial", *Dermatol. Surg*. Off. Publ. Am. Soc. Dermatol. Surg. Al 33, 1228-1233; discussion 1233.
10. Leheta T.M (2009), "Role of the 585 nm pulsed dye laser in the treatment of acne in comparison with other topical therapeutic modalities", *J. Cosmet, Laser Ther*. Off. Publ. Eur. Soc. Laser Dermatol. 11, 118-124.
11. Seaton E.D et al (2003). "Pulsed-dye laser treatment for inflammatory acne vulgaris: randomised controlled trial", *The Lancet*, 362, 1347-1352.
12. Harto A., García-Morales I., Belmar P. & Jaén, P. (2007), "Pulsed dye laser treatment of acne. Study of clinical efficacy and mechanism of action", *Actas Dermosifiliogr*. 98, 415-419.
13. Choi Y.S et al (2010), "Intense pulsed light vs. pulsed-dye laser in the treatment of facial acne: a randomized split-face trial", *J. Eur. Acad. Dermatol. Venereol. JEADV*, 24, 773-780. ❑