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ORIGINAL RESEARCH ARTICLE

Efficacy and safety of intense pulsed light in the treatment of mild-to-moderate acne vulgaris

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***Abstract*:** Acne vulgaris is a very common chronic inflammatory disease of pilosebaceous units. It can be associated with considerable loss of self-esteem and psychological morbidity when left untreated. With the emergence of lasers and intense pulsed light, long-term reduction of acne lesions is now possible. The success of these optical devices depends on the selected parameters and biologic variables of patient. The objective of this study is to determine the efficacy and safety of intense pulsed light (IPL) in the treatment of mild-to-moderate acne vulgaris. This interventional study was conducted for a period of one year after approval of synopsis. A total of 75 patients of mild-to-moderate acne vulgaris were included through non-probability, convenience sampling. Patients were subjected to intense pulsed light (IPL) therapy once a week for four weeks. Digital photography was done at the baseline and at the sixth week. Follow-up was done after two weeks of completion of four sessions. Repeated measurement ANOVA was used for significance of IPL at six weeks of follow-up. The p value < 0.05 was taken as significant. IPL was effective in 52% of the patients. Out of all cases, 6 (8%) showed excellent results. 33 (44%) showed >50% reduction with therapy. Percentage reduction was observed as 49% ± 20% at final follow-up. Papules count was reduced from 11.95 ± 2.89 to 6.69 ± 2.96, pustules count was reduced from 2.55 ± 1.54 to 0.79 ± 1.02 from baseline to final follow-up visit. 16 subjects showed mild erythema that resolved within 24 h. None of the patients showed any severe side effects at final follow-up visit. We conclude from the results of this study that IPL is safe and efficacious in more than half of the patients in the treatment of mild and moderate acne vulgaris. A long-term follow-up is required to determine long-term safety on skin following such procedures.

***Keywords*:** Acne vulgaris; intense pulsed light; pustules; papules

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Introduction

Acne vulgaris is a chronic inflammatory disease of pilosebaceous units characterized by seborrhea, comedones, erythematous papules, pustules and sometimes nodules, pseudocysts and scarring. The worldwide prevalence of acne is about 45% in girls and 56% in boys, aged 14 to 16 years[1]. Morbidity due to acne vulgaris is prevalent, especially in females, with major psychosocial implications[2,3].

Various treatment modalities are available including local therapy (cleansing, topical antibiotics, azelaic acid, benzoyl peroxide, retinoids, lasers and photodynamic therapy), systemic therapy (such as antibiotics), systemic retinoids and hormones (oral contraceptives, glucocorticoids, gonadotrophin-releasing hormones agonist and antiandrogens)[4].

As therapeutic options may cause undesirable effects

such as mild dryness, redness, contact dermatitis, photosensitivity and a range of systemic upsets, there is a constant search for new therapies aimed at good control of the disease, cost-effectiveness and fewer side effects[5].

Intense pulsed light (IPL) is absorbed by porphyrins, produced by *Propionibacterium acnes*, which lead to production of reactive oxygen species with consequent bactericidal effects. This causes the reduction of sebum by photothermolysis of the blood vessels[6].

Lasers or light-based therapies are increasingly being used for effective acne treatment with minimal downtime and side effects. Sung *et al.* reported that more than 63% of the study cases improved when IPL was used[7]. Kawana *et al.* reported that IPL had a satisfactory effect on acne vulgaris in Asians[8]. Yeung *et al.* reported a 43% reduction in acne when IPL was used[9].

IPL treatment may cause transient redness, hypo- and hyper-pigmentation and blistering. Precautions must be taken in the IPL treatment of pregnant females. People on systemic retinoids should not have IPL therapy[10].

Limited data is available regarding the response of acne to IPL therapy in Asian skin type. The present study is aimed at evaluating the efficacy and safety of intense pulsed light in the treatment of acne vulgaris in our patient population.

Materials and methods

Setting

The study took place in the Dermatology Department Unit-II, King Edward Medical University, Mayo Hospital, Lahore, Pakistan.

Duration of study

The duration of study was one full year after the approval of synopsis.

Sample size

The sample size was 75 patients of mild-to-moderate acne vulgaris selected from Dermatology Outdoor department.

Sampling technique

The sampling technique used was non-probability, convenience sampling in which subjects were selected due to convenient accessibility and proximity to the researchers.

Sample selection

Inclusion criteria:

1. Mild-to-moderate acne vulgaris
2. Either sex
3. Age between 12–35 years

Exclusion criteria:

1. Any history of photosensitivity or photosensitive disorders
2. Patients with history of any topical or systemic retinoid therapy four weeks prior to starting of the treatment[10]
3. Pregnancy and lactation
4. Severe acne
5. Immunosuppression
6. Patients on any systemic or topical medication for acne. No topical or systemic acne medications were allowed during the study period.

Setting

This was an interventional study.

Research methodology

A total number of 75 patients fulfilling the inclusion and exclusion criteria, and after taking the written informed consent, were enrolled. Patient history was taken and clinical examination was done. Lesion counting, according to the Hayashi acne grading criteria for acne severity, was also done. Hayashi classifies acne based on the number of lesions: 0–5 as mild, 6–20 moderate, 21–50 severe and >50 very severe[11]. All foreign elements, *e.g.* make-up, were removed and coolant gel was applied. Goggles were used for protection of the eyes. A test shot was given before therapy. Patients were subjected to IPL therapy 420 nm; spot size: 8 mm × 40 mm; pulse duration: 3–5 ms, delay: 30 ms, fluence: 15–21 J/cm2) once a week for four weeks. After the treatment session, icing was done and protection from UV light for the following two months was advised. Digital photographs were taken at the baseline and on the sixth week, which was a follow-up visit two weeks after completion of the therapy. Evaluation was done by two different investigators.

Statistical analysis

The collected information was transferred to SPSS version 13.0 and analyzed accordingly. The qualitative data, such as gender and marital status, were presented in the form of frequency table and percentage. The quantitative data, such as age, number of papules, pustules and nodules, were presented in the form of mean ± standard deviation. Repeated measurement analysis of variants was used for significance of IPL at six weeks of follow-up. The p value < 0.05 was taken as significant.

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Ethics statement

This study was approved by the Advanced Studies and Research Board (ASRB) of King Edward Medical University (KEMU).

Results

In this study, 75 patients of acne vulgaris were selected and enrolled from the outpatient Department of Dermatology Unit-II, Mayo Hospital, Lahore, Pakistan, according to inclusion criteria. The mean age of the patients was 19.53 ± 3.11 years (**Table 1**). The male-to-female ratio was 1:1.8. Out of all cases, only 5 (7%) were married while 70 (93%) of the cases were unmarried. Among all the cases, 6 (8%) had mild while 69 (92%) were suffering from moderate degree of acne.

After IPL therapy, the total count was reduced from 14.49 ± 2.93 to 7.48 ± 3.34 at the final follow-up visit. Papule count reduced was from 11.95 ± 2.89 to 6.69 ± 2.96 and pustule count was reduced from 2.55 ± 1.54 to 0.79 ± 1.02 from baseline to final follow-up visit with a significant percentage reduction (p value = 0.000, **Table 2**).

Both genders had a significant reduction in total lesion count but when they were compared, it was noticed that female cases showed greater decrease in total lesion count as compared to male cases (p value > 0.0001, **Table 3**).

IPL was effective in 52% of the patients. Out of all cases, 6 (8%) showed excellent results while 33 (44%) showed >50% reduction with therapy (**Figure 1**).

Immediate side effects

Transient immediate stinging and mild erythema were the only side effects seen in 16 patients, which were resolved within 24 h.

Discussion

IPL is being used to treat acne vulgaris in different countries of Asia with promising results[12].The pathogenesis of acne vulgaris involves follicular epidermal hyperproliferation with subsequent plugging of the follicle, excess sebum production, the presence and activity of the commensal bacteria *P. acne*, and inflammation[13]. The therapeutic effects of IPL are attributed mainly to photothermolysis of the sebaceous glands.

In this study, we included 75 cases of mild-to-moderate acne vulgaris. The mean age of our patients was 19.53 ± 3.11 years.

Table 1. Descriptive statistics of age (years) of both genders

Gender of the patients		Male	Female
	N	27	48
Age (years)	Mean	19.07	19.79
	SD	2.62	3.36
	Minimum	14	14
	Maximum	25	31

t-test = 0.958; p value = 0.341 (insignificant)

There is a great variability in results obtained by IPL in different studies because the results not only depend on IPL selected parameters but also on the patient's biological variables.

We observed 49% reduction of lesion count at final follow-up visit. These results matched with another study conducted by Kumaresan *et al.*, who reported 49.19% improvement in the acne lesions after four sessions of IPL[14]. This may be because the study was conducted in the same race (Asian) with same method and wavelength of IPL as in our trial.

Elman *et al.* treated 19 patients with intense pulsed light (specifically, Skin Station device which uses light and heat technology) exposed to twice-a-week therapy sessions for four weeks, and reported that 85% of the patients experienced more than 50% improvement in the count of their acne vulgaris lesions[12]. It could be the difference in the number of sessions and the combination of pulses of heat with pulses of light that caused a difference in the clinical outcomes of this study.

Dierickx reported improvement of 72% in non-inflammatory acne vulgaris lesions and a total of 73% in inflammatory acne vulgaris lesions at six months post-therapy on the Lux V™ hand-piece from the Palomar Medical Technologies IPL systems[15]. In his study, 14 patients were selected with mild-to-moderate inflammatory acne vulgaris lesions and given five treatments that were governed and followed up every 2–4 weeks. This difference from our study can be explained by the fact that 2–3 passes were given at a fluence of 10 J/cm^2, which was different from our fluence of 15–21 J/cm^2. Other factors contributing to the differences in the clinical outcome include the geographic conditions of Pakistan, *i.e.* long duration of summers, and the difference in skin types. The evaluation of

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Table 2. Descriptive analysis of papules, pustules and total score of patients

	Baseline	2nd visit	3rd visit	4th visit	5th visit	*p*-value
Papules	11.95 ± 2.89	9.01 ± 2.76	7.57 ± 2.78	6.77 ± 2.79	6.69 ± 2.96	0.000
Pustules	2.55 ± 1.54	1.61 ± 1.28	1.08 ± 1.27	0.87 ± 1.11	0.79 ± 1.02	0.000
Total score	14.49 ± 2.93	10.63 ± 2.73	8.65 ± 2.92	7.64 ± 3.15	7.48 ± 3.34	0.000
Percentage reduction in score from baseline	–	26.8% ± 10.8%	40.7% ± 14.7%	47.8% ± 18.7%	49% ± 20.0%	0.000

Table 3. Comparison of percentage reduction in total lesion count in both genders

Percentage reduction in total lesion count at	Male (%)	Female (%)	*t*-test value	*p*-value	Significance
2nd visit	25.6% ± 10.6%	27.5% ± 10.9%	-0.716	0.476	Insignificant
3rd visit	36.8% ± 14.1%	42.8% ± 14.6%	-1.753	0.084	Insignificant
4th visit	42.5% ± 15.8%	50.7% ± 19.7%	-1.846	0.069	Insignificant
5th visit	42.0% ± 17.4%	52.9% ± 20.5%	-2.311	0.024	Significant
***p*-value**	0.000	0.000	0.000		

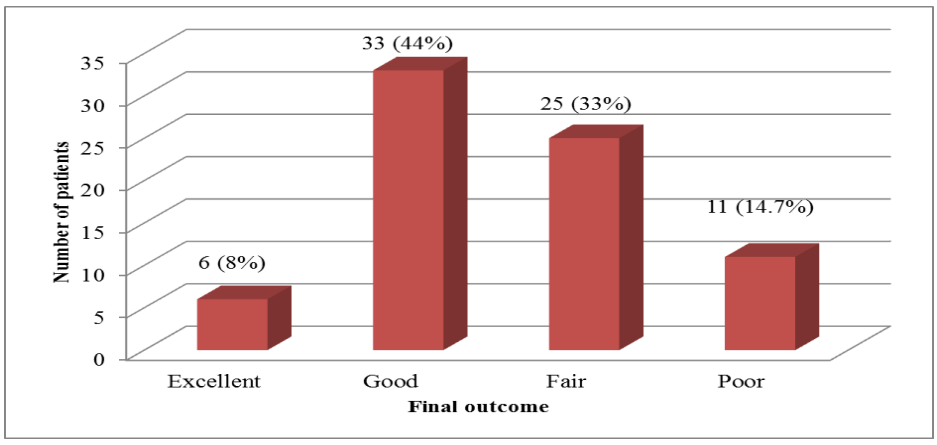

Figure 1. Distribution of outcome of the treatment

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the patients by blind investigators and/or self-assessment of improvement by the patients could have changed the results.

Rojanamatin and Choawawanich showed excellent results of up to 87.7% decrease in lesion count at 12 weeks after the IPL treatment. They reported that the degree of improvement was better and long-lasting with the combined regimen[16]. The results of this study were better than our trial, maybe because of the different wavelengths (550–700 nm) used in that trial and other factors contributing to the difference of study outcomes including the prolonged study period and a combination regimen (short contact of topical ALA and IPL). Also, the number of patients was far fewer than the patients included in our study. The results of his study could have been different if more patients were enrolled.

In our study, 21% of the patients showed mild erythema, which was resolved within 24 h. None of the patients showed any severe side effects at final follow-up visit. These results were comparable with a study of Rojanamatin and Choawawanich who evaluated 14 patients and observed mild and reversible side effects[16]. Mohanan *et al.* evaluated 10 patients in his trial and observed no adverse effects[17]. It is further established that with standard care, there is no increased risk of side effects on Asian skin.

IPL has proved beneficial for the treatment of acne vulgaris in patients who are either unwilling to take medications or cannot take medications due to co-morbid conditions. It is also beneficial in non-compliant patients or those who are unresponsive to other medications. It may have even better results in Asian patients after modulating the other parameters as pulse duration, wavelength and energy levels. Trials using different IPL parameters, larger sample size and long duration of study periods are required.

Conclusion

We conclude from the results of this study that IPL is safe and efficacious in more than half of the patients in the treatment of mild and moderate acne vulgaris. However, a long-term follow-up is required to determine long-term safety on skin following such procedures.

Author contributions

All authors have contributed towards data collection, analysis and writing of the manuscript.

Conflict of interest

The authors declare no potential conflict of interest with respect to the research, authorship, and/or publication of this article.

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