Original Article

Evaluation of Efficacy of Intense Pulsed Light (IPL) System in the Treatment of Facial Acne Vulgaris: Comparision of Different Pulse Durations; A Pilot Study

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Abstract:

Background: Adequate control of acne is difficult, regardless of the various conventional modalities. Intense Pulsed Light (IPL) system is one of the emerging options that are become increasingly useful.
Methods: To achieve the best IPL parameters we evaluated the efficacy and tolerability of IPL at 752-nm wavelength, 35 j/cm2 fluence, 55-ms pulse duration in comparison with 572-nm wavelength, 35 j/cm2 fluence, 101-ms pulse duration, in a 5 week, controlled, double-blind, split-face clinical trial. Final assessment was made by comparison of the changes in inflammatory and non-inflammatory acne lesions count and the Acne Global Severity Scale (AGSS) between two groups, based on standardized photography.
Result: Fifteen female patients, with mean age of 23.53±2.47 years (range 20-28) completed the 5-week therapy period. For both therapies, significant reductions (approximately 30%) in the comedone and inflammatory lesions count were observed (p=0.0024). There was no significant difference in the efficacy of the two treatments in reducing the percentage of comedone and inflammatory lesions count from baseline to 5th week (p=0.76 and p=0.61, respectively). Based on acne global severity scale (AGSS), no significant difference in the severity of acne lesions of the two treatments was observed at 5th-week visit (p=0.26).
Conclusion: Considering the lack of significant difference between the two tratments and since greater risks are associated with lower pulse duration, the use of longer pulse durations is recommended, especially in darker skin phenotype. Further studies with larger number of patients are required to fully comparison of efficacy of these parameters in IPL systems for acne vulgaris.
Keywords: acne, intense pulsed light (ipl) system, pulse duration, treatment.

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Introduction

Acne vulgaris is a chronic debilitating disease that affects approximately 85% of young people around the world (1). Besides economic problem, there are psychological impact and cosmetic disturbances that cause social isolation and decrease self-confidence of the patients. This multifactorial disorder of the pilosebaceous unit is characterized by noninflammatory blackheads (open) and whiteheads comedones (closed), as well as inflammatory papules, pustules, cysts and nodules. The course of the acne is unpredictable (2, 3). Despite different conventional therapeutic options which are available for acne, many patients are unable to achieve adequate control of their disease. Given the limitations of conventional approaches in the treatment of acne (e.g. antibiotic resistance, limited long-term efficacy, potential side effects, teratogenecity), search for the new modalities, that have better compliance and sustained effectiveness, to be continued (4). One of these emerging treatment, that increasingly become useful, is intense pulsed light (IPL) system (5, 6). To achieve the best IPL parameters, we decided to compare two pulse durations of 55ms and 101ms at 572-nm wavelength with a fix fluence for the treatment of inflammatory and noninflammatory acne lesions in our study.

Methods

Ethical approval

A total of 15 Persian patients who satisfied the inclusion criteria and gave written informed consent to participate in this trial were chosen for the study. This study was approved by the Ethical Committee of the Shahid Beheshti University of Medical sciences.

Study design

This controlled, single-blind, split-face clinical trial was conducted to evaluate the efficacy and tolerability of IPL at 572-nm wavelength, 35 j/cm2 fluence, 55-ms pulse duration in comparison with 572-nm wavelength, 35 j/cm2 fluence, 101-ms pulse duration on patients with facial acne vulgaris referring to the laser center of the Shohada-e-Tajrish hospital between October 2010 and February 2011.

Patient/population

The exclusion criteria included: age under 18 years old, pregnancy, breastfeeding, tendency to form keloid or hypertrophic scar, and a history of photosensitivity or those who take phototoxic medication. In addition, patients with history of oral retinoid use within one year of the study entry were also excluded. The washout period for prior acne therapies was 2 weeks for topical therapy and 8 weeks for any systemic or laser therapies. Other concomitant acne treatments at any location were not allowed during this trial.

Intervention

The IPL system used in this study was a ke-medical hair&skin IPL using a water contact cooling sapphire handpiece (dominant wavelength ranges 400–625nm until 900nm). each side of the patient's face was randomized to receive IPL treatment at 572-nm wavelength, pulse duration 55-ms, spot size 2 mm, fluence 35 j/cm2 to one side of the face, while the contralateral side treated by IPL 572-nm wavelength, pulse duration 101-ms, spot size 2 mm, fluence 35 j/cm2 at baseline followed by once a week for 5 weeks. To minimize the pain of the procedure, topical anesthesia by lidocaine-p cream was performed 45 min before initiating any procedures for each participant.

Assessment

For each patient, age, sex, Fitzpatrick skin phenotypes, duration of the disease, prior treatments and medical history were noted. Standardized bilateral facial photography with VisioFace ® Quick (Courage and Khazaka, Cologne, Germany) was taken at baseline and 5 weeks after the baseline visit for final assessment of all the patients. The clinical severity assessment was made by two blinded dermatologists, based on the Acne Global Severity Scale (AGSS) which is approved by the U.S. Food and Drug Administration. In addition, acne lesions counts including (non-inflammatory comedones and inflammatory papules/pustules and cysts/nodules) on both sides of the face were

determined by them. Comparison of the change in lesions count and the 5-point grading scale score (AGSS) from baseline was performed between two groups, based on photography. Tolerability was also assessed by evaluating adverse events (pain, erythema, scar, and post inflammatory hyper /hypo pigmentation) at each visit.

Statistical analysis

Results are expressed as mean±standard deviation. For each treatment group, Wilcoxon signed-rank test was used to evaluate the differences of facial comedone and inflammatory lesion counts among the two time-points (baseline, week 5). To compare the efficacy of two treatments at each visit, the Wilcoxon signed-rank test was conducted. Statistical analysis was performed using the statistical software SPSS 16.0.0. (SPSS Inc. Chicago, IL, U.S.A.). P values less than 0.05 were considered significant.

Result

Fifteen patients, all women, with mean age of 23.53±2.47 (range 20-28) years with diagnosis of acne vulgaris were enrolled in the study. All the patients completed the 5-week treatment sessions. The Fitzpatrick skin type of the patients was as follows: 9 (60%) patients were grade II and the others were grade III. The patient mean duration of disease was 3.75±2.41 (range 0.66-9 years).

For both therapies, patients experienced a reduction in the mean of the comedone and inflammatory lesion counts over the treatment sessions (Table 1 and 2). For both IPL pulse durations, Wilcoxon signed-rank test showed significant reductions in the comedone and inflammatory lesion counts as compared with baseline (p-values at most 0.0024).

Table 1. Mean (SD) of Facial inflammatory lesion Counts for the two treatments at baseline and at 5 weeks after beginning of the therapy

	IPL at 572-nm, 55-ms pulse duration	IPL at 572-nm, 101-ms pulse duration
Baseline	11.43 ± 8.00 8.5 (5-36)*	9.73 ± 5.80 10 (3-25)
5th Week	8.00 ± 5.68 7 (2-24)	6.73 ± 5.27 5 (1-22)

* median (range)

Table 2. Mean (SD) of facial comedone counts for the two treatments at baseline and at 5 weeks after beginning of the therapy

	IPL at 572-nm, 55-ms pulse duration	IPL at 572-nm, 101-ms pulse duration
Baseline	11.33 ± 5.55 11 (3-24)*	10.33 ± 3.56 9 (4-17)
5th Week	7.80 ± 4.34 6 (1-15)	6.8 ± 3.19 7 (2-12)

* median (range)

At week 5, no statistical significant difference in the comedone and inflammatory lesion counts of the two therapies was observed (Wilcoxon signed-rank test, p=0.15 and p=0.09, respectively).

There was no statistical significant difference in the efficacy of the two treatments in reducing the percentage of comedone and inflammatory lesion counts from baseline to 5th week (Wilcoxon signed-rank test, p=0.76 and p=0.61, respectively) (Fig.1).

In patients with Fitzpatrick skin type II, no significant difference was observed in the efficacy of the two treatments in reducing the percentage of comedone and inflammatory lesion counts from baseline to 5th week (p=0.57 and p=0.14, respectively). Also, mean percentage reduction of these lesions was not significantly different between two treatments in patients with skin type III (p=0.84 and p=0.31, respectively).

In 55-ms pulse duration group, based on acne global severity scale, 12 out of 15 patients (80%) had relatively severe acne (8 patients with grade 4 and four with grade 5) at baseline visit. After 5 sessions of therapy, severe acne was observed in only two of these patients (both with grade 4). In 101-ms pulse duration group, 10 patients (66.67%) had severe acne (6 patients with grade 4 and four with grade 5) at baseline. In this treatment group,

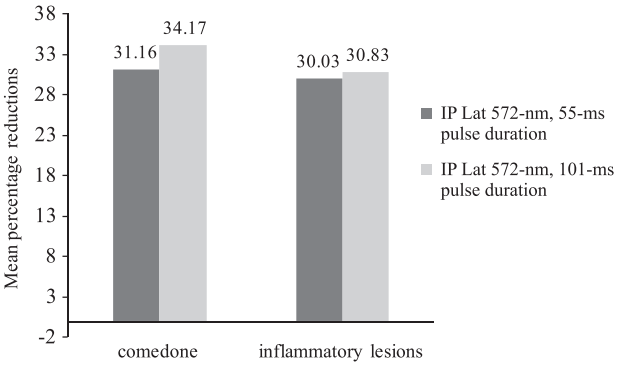

Figure 1. Mean percentage reductions of acne Lesions (from baseline to the 5th Week).

after the 5th week, only 5 patients (4 with grade 4 and 1 with grade 5) had severe acne. For both 55-ms and 101-ms IPL pulse durations, Wilcoxon signed-rank test showed significant reductions in the severity of acne lesions (based on AGSS) as compared with baseline (p=0.0003 and p=0.005, respectively).

At baseline visit, no significant difference in the severity of acne lesions of the two therapies was observed (p=0.32). Also, there was no significant difference in the severity of acne lesions at final visit (p=0.26).

Reported adverse effects included pain and erythema on both sides of the face during the therapy sessions. Six out of 15 patients (40%) experienced pain (4 with mild and 2 with moderate pain). Also, mild erythema was observed in 3 (20%) of patients.

Conclusion

Despite many advances in the treatments of acne vulgaris, the best option is still controversial. There are several conventional medical treatments of acne, but poor efficacy (topical antibiotics), recurrence (topical antibiotics), high cost (systemic isotretinoin) and adverse drug reactions like irritation (topical retinoids), bacterial resistance (systemic antibiotic) and teratogenisity (systemic isotretinoin) were seen with these treatments. There is obvious need for new, safe, and effective modalities in the acne treatment (7, 8). In the 1990s, new acne treatments such as chemical peeling, photodynamic therapy and phototherapy with intense pulsed light (IPL) appeared (9).

Intense pulsed light sources use a flashlamp to emit a non-coherent, nonlaser, pulsed, broad spectrum of light with different wavelengths (in the ranges of 400-1200 nm) depending of their cut-off filters (10, 11). There is a variety of mechanisms postulated to explain the effect of IPL systems on acne vulgaris, e.g. because of its thermal impact on hyperfunctioning and enlarged sebaceous glands, IPL could cause a marked decrease in acne lesions count and severity (8-13). One of the best advantages of this device is modifiability of various parameters which included wavelength, fluence, pulse duration, and pulse delay depending on various factors. There are some studies which evaluated the different parameters (such as fluence, wavelength) in the treatment of acne for achieving the best result; but best of our knowledge, there are no study to compare various pulse durations (11, 14, 15).

Various success rates are reported by a variety of intense pulsed light devices (lPLs) for the treatment of acne, some are as follows: In one study, 30 female patients with mild-to-moderate acne were treated 3 times, three weeks apart with acne filter of IPL (restricted wavelength bands from 530 to 750 nm) on one side of the face. Other parameters were fluence 8.0 J/cm2 for skin type III and 7.5 J/cm2 for skin type IV, pulse durations of 2.5 ms and double light pulse with 10-ms interval. Benzoyl peroxide (BP) gel was used one both site. Result has shown a reduction in irregular pigmentation, acne red macules (63% on the laser-treated side versus 33% on the untreated side) and improvement of skin tone. But there was no significant difference in both sides of face for inflammatory acne lesion counts 3 weeks after treatment. The filter of the IPL was used as a device for selective photothermolysis, target the blood vessels that supply the sebaceous glands (16). Elman Et al. treated 19 acne patients with IPL (twice weekly, for 4 weeks) and found more than 50% improvement in acne lesions in 85% of the cases. In another study, 14 patients with mild-to-moderate inflammatory acne lesions received five treatments every 2–4 weeks by the Lux V™ handpiece from the Palomar Medical Technologies IPL systems (EsteLux® , MediLux™, and StarLux™ Systems). Six months after therapy, clearance rates of 73% for inflammatory and 72% for noninflammatory acne lesions were observed. There was 50% reduction in inflammatory acne vulgaris with IPL-ClearTouch/ SkinStation (Radiancy, Orangeburg, NY, USA) in the study of Paithankar et al (9). In this study, we compared two different pulse durations (55-ms and 101-ms) in IPL system (35 j/cm fluence, 572-nm,2mm spot size) and found approximately 30% reduction in the comedone and inflammatory lesion counts as compared with baseline in both groups. No excellent result of IPL was seen in this trial may be explained by the cut off filter which is used. The 535 nm filter may work better, but in Iranian patients with nearly dark skin because of risk of post inflammatory hyperpigmentation we preferred using 572 nm filter.

Erythema, purpura, edema, pain, scar and

pigmentation changes are most common side effects reported by these systems (13-15, 17). In our trial, only mild to moderate erythema and pain were occurred that were reversible and improved by using of ice pack and topical zinc oxide. Also, adverse effects and tolerability did not differ significantly between two groups (55-ms and 101-ms pulse duration). Our result suggests IPL system is an effective and safe option for acne treatment which can reduce both number and severity of inflammatory and non-inflammatory acne lesions, with minimal downtime and reversible side effects (Fig.2-3). Considering the lack of significant difference between the two groups and since greater risks are associated with lower pulse durations, we recommend the use of longer pulse durations such as 101-ms for this common problem, secondary to the darker skin phenotype in our country.

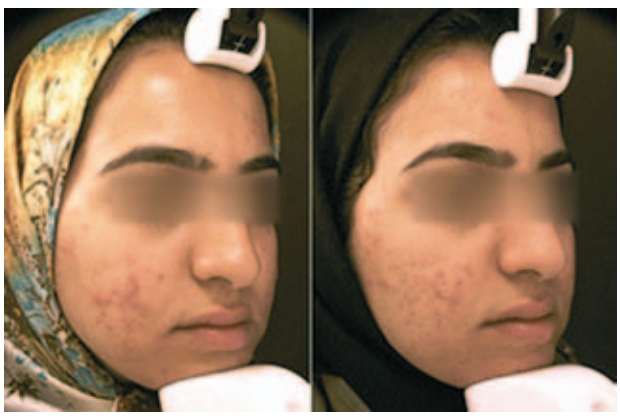

Figure 2. 23-year-old woman with acne vulgaris, pre (right) and 5 weeks post (left) IPL treatment (572-nm wavelength, fluence 35 j/cm2,101-ms pulse duration).

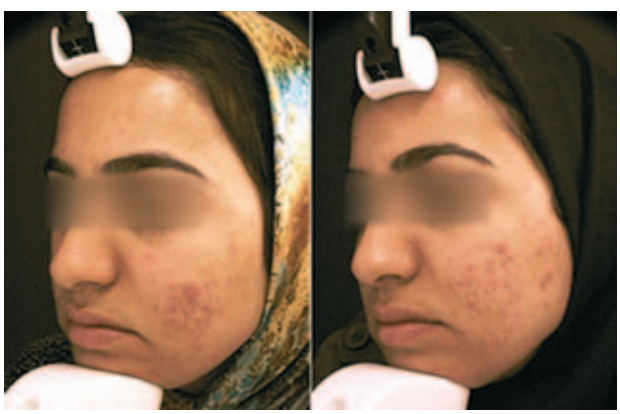

Figure 3. 23-year-old woman with acne vulgaris, pre (right) and 5 weeks post (left) IPL treatment (572-nm wavelength, fluence 35 j/cm2, 55-ms pulse duration).

Small number of participants and lack of follow up were the limitations of this trial. Further studies with larger number of patients are required to fully comparison of efficacy of these parameters in IPL systems for acne vulgaris. Also, comparison of different cutoff filters such as 535 nm and 572 nm are suggested for future studies.

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