Efficacy of Intense Pulsed Light Therapy in the Treatment of Facial Acne Vulgaris: Comparison of Two Different Fluences

Monika V Patidar, Ashish Ramchandra Deshmukh, Maruti Yadav Khedkar

Abstract

Background: Acne vulgaris is the most common disease of the skin affecting adolescents and young adults causing psychological distress. The combination of antibiotic resistance, adverse effects of topical and systemic anti-acne medications and desire for high tech approaches have all led to new enthusiasm for light based acne treatment. Intense pulse light (IPL) therapy has three modes of action in acne vulgaris i.e., photochemical, photo thermal and photo immunological. Aims: (1) to study efficacy of IPL therapy in facial acne vulgaris. (2) To compare two fluences - one normal and other subnormal on right and left side of face respectively. Methods: (Including settings and design and statistical analysis used). Total 45 patients in age group 16 to 28 years with inflammatory facial acne vulgaris were included in prospective study. Baseline data for each patient was recorded. All patients were given 4 sittings of IPL at 2 weeks interval and were followed for 2 months every 2 weeks. Fluence used was 35J/cm² on right and 20J/cm² on left side. Percentage reduction in lesion count was calculated at each sitting and follow up and graded as mild (0-25%), moderate (26-50%), good (51-75%) and excellent (76-100%). Side effects were noted. The results were analysed using Mann-Whitney Test. Results: On right side, excellent results were achieved in 10(22%), good in 22(49%) and moderate in 13(29%) patients. On left side excellent were results achieved in 7(15%), good in 19(42%) and moderate in 16(43%) patients. There was no statistically significant difference noted in efficacy of two fluences used in treatment of facial acne vulgaris. Conclusions: IPL is a effective and safe option for inflammatory acne vulgaris with minimal reversible side effects. Subnormal fluence is as effective as normal fluence in Indian skin.

Key Words: Acne vulgaris, Indian skin, intense pulsed light

Introduction

Acne vulgaris is the most common disease of the skin. It is a very common condition affecting adolescents and young adults.[1,2] It usually causes significant psychological distress and reduced self-esteem of these young patients.[3,4] It is a chronic inflammatory disease affecting the pilosebaceous unit. There is increased secretion of sebum and abnormal desquamation of the follicular epithelium which leads to obstruction of the pilosebaceous unit and comedo formation. The presence of sebum in the pilosebaceous unit attracts Propionibacterium acnes and plays an important role in mediating follicular inflammation.[5,4] The existing oral and topical anti-acne medications are limited by efficacy, adverse effects, and patient compliance. The combination of antibiotic resistance, adverse effects of topical and systemic anti-acne medications, and desire for high-tech approaches has all led to new enthusiasm for light-based acne treatment.[7-18] Intense pulsed light (IPL) therapy has three therapeutic roles in acne vulgaris namely photochemical, photothermal, and photo-immunological.[19] Basic principle of this therapy is more or less selective thermal damage of P. acnes. P. acnes synthesizes and stores large amount of porphyrins.[20-30] Once the porphyrin is exposed to visible light, it becomes chemically active and transfers...
to an exited state, resulting in the formation of singlet oxygen, which combines with the cell membrane to destroy *P. acnes*. We have used IPL as a monotherapy in our study and compared the two types of fluence: one is normal and other is subnormal fluence. The purpose of this study was to investigate the efficacy of IPL therapy in Indian skin.

**Methods**

A total of 45 patients who satisfied the inclusion criteria and those who had given written informed consent from patients and/or guardians were chosen for the study. The inclusion criteria included age between 16 and 28 years and cases with inflammatory facial acne vulgaris. The exclusion criteria were tendency to form keloid and hypertrophic scar, history of photosensitivity, seizures, pregnancy, breastfeeding, tanned skin, history of treatment with systemic and topical antibiotics for acne vulgaris within the last 1 month and oral isotretinoin within the last 6 months of the study. For each patient, Fitzpatrick skin type, duration of the disease, prior treatment, and medical history were noted. The acne vulgaris was graded according to acne global severity scale which is approved by the US Food and Drug Administration. In addition, numbers of lesions were counted separately on both sides of the face by inspection and by taking photographs at each sitting and follow-up. Patients were advised to remove the entire makeup and wash face with soap and water before every sitting. All the safety measures were followed during the treatment. All the patients were given four sittings of IPL at 2 weeks interval and were followed up for 2 months every 2 weeks.

Parameters used were wavelength (cut off filter) – 550 nm to 1200 nm, spot size – 40 mm² × 8 mm², pulse duration – 5 ms (two pulses), pulse interval – 10 ms, and fluence – right side - 35 J/cm² and left side - 20 J/cm². The fluence was reduced by 20% on forehead and bony prominences so as to avoid postinflammatory hyperpigmentation and scarring.

After each sitting and at each follow-up, the side effects were noted. The immediate side effects such as erythema, burning sensation, edema, pain and delayed side effects such as hyperpigmentation, hypopigmentation, milia, blister and scarring were looked for. Appearance of new lesions during treatment was also noted on both sides of the face.

The percentage reduction in the number of lesions was calculated at each sitting and follow-up and was graded as mild (0–25%), moderate (26–50%), good (51–75%), and excellent (76–100%).

**Results**

A total of 45 patients, 29 females and 16 males, with mean age of 21.15 ± 2.36 (range 16–28) years with diagnosis of acne vulgaris were enrolled in the study. All the patients had completed four sittings of IPL and 2 months of complete follow-up. Fitzpatrick skin type of the patients were as follows: 21 (46.7%) patients were Grade IV and the remaining 24 (53.3%) patients were Grade V. Of the 45 patients, 27 patients (60%) had acne Grade II lesions and 15 patients (33.3%) had acne Grade III lesions. Only 3 patients (6.7%) had acne Grade IV lesions. On both sides of the face, both fluences showed reduction in lesion counts and statistical analysis was carried out using Mann–Whitney U-test and Wilcoxon signed-rank test. *P* < 0.05 was considered statistically significant.

There was no statistical significant difference noted in the efficacy of the two fluences used on the right and left sides of the face in reducing the number of acne lesion counts when compared at the end of the first, second, third, and fourth sittings [Table 1].

There was no statistically significant difference noted in the efficacy of the two fluences used on the right and left side of the face in reducing the number of acne lesion counts when compared at the end of each follow-up [Table 2].

Lesion count was reduced by 45.11% on the right side and by 41.98% on the left side at the first follow-up. The lesions at the second follow-up were reduced by

| Table 1: Comparison of average lesion count in sittings on the right and left side of face (Mann-Whitney U-test) |
|---------------------------------------------------------------|
| **Mean±SD** | **Z** | **P** |
| Right side | Left side |
| First sitting | 37.98±19.23 | 36.96±20.51 | 0.424 | 0.672 NS |
| Second sitting | 32.98±19.61 | 32.80±19.90 | 0.073 | 0.923 NS |
| Third sitting | 27.82±14.09 | 28.73±17.52 | 0.52 | 0.958 NS |
| Fourth sitting | 24.53±14.26 | 24.13±15.70 | 0.28 | 0.789 NS |

NS: Not significant, SD: Standard deviation

| Table 2: Comparison of average lesion count in follow-up on the right and left side of face (Mann-Whitney U-test) |
|---------------------------------------------------------------|
| **Mean±SD** | **Z** | **P** |
| Right side | Left side |
| First follow-up | 20.84±12.17 | 21.44±12.73 | 0.20 | 0.841 NS |
| Second follow-up | 18.22±11.98 | 19.56±13.11 | 0.275 | 0.784 NS |
| Third follow-up | 16.49±9.75 | 17.78±11.35 | 0.315 | 0.752 NS |
| Fourth follow-up | 13.87±8.40 | 15.58±11.11 | 0.594 | 0.552 NS |

NS: Not significant, SD: Standard deviation
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51.79% on the right side and by 46.97% on the left side [Figures 1-3]. At the third follow-up, the lesion count decreased by 57.17% on the right side and by 51.9% on the left side. At the time of the fourth follow-up, lesion count decreased by 63.49% on the right side and 57.9% on the left side.

A statistically significant difference was noted in the reduction of acne lesion counts on the right and left side using two different fluences when baseline counts were compared with the first and fourth follow-ups [Table 3].

Percent reduction in the number of acne lesions at the final follow-up was compared with baseline lesion count and was graded as mild (0–25%), moderate (26–50%), good (51–75%), and excellent (76–100%). On the right side, reduction of acne lesion was moderate in 13 patients, good in 22 patients, and excellent in 10 patients. On the left side, reduction of acne lesion was mild in 2 patients, moderate in 16 patients, good in 19 patients, and excellent in 7 patients. Only one patient showed increase in lesion count on the left side [Table 4].

Other side effects such as hyperpigmentation, scarring, blister, and pain were not reported in any of the patients [Table 5].

**Discussion**

Despite many advances in the treatment of acne vulgaris, the best option is still controversial. There are several conventional medical treatments for acne, but they have limitations such as poor efficacy (topical antibiotics), recurrence (topical antibiotics), high cost (systemic isotretinoin), and adverse drug reactions such as irritation (topical retinoid), bacterial resistance (systemic antibiotic), and teratogenicity (systemic isotretinoin). There is obvious need for new, safe, and effective modalities in acne treatment. IPL can be utilized either as monotherapy or as an adjuvant treatment to medical therapies. It is a good alternative when topical or systemic medicines are contraindicated or not tolerated. It can be considered in those patients in whom isotretinoin is contraindicated or not tolerated.

As Indian patients have dark skin type, there are more chances of scarring and hyperpigmentation and that is why we have used two types of fluence in our study – one is normal and other is subnormal fluence. None of our patients shows hyperpigmentation and scarring. Itching was most commonly complained side effect which was mild in nature. Only two patients required the use of antihistamine, and rest of the patients did not require any form of medication [Figure 4]. This side effect was not reported in any of the other studies using this therapy.

Two patients (4.4%) developed erythema and three patients (6.7%) complained of burning sensation. Two patients (4.4%) developed milia.

High fluence used in our study had more photothermal and photochemical actions whereas subnormal fluence...
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had more photochemical and photo-immunological actions.\[35-38]\) Proven efficacy, minimal to no systemic side effects, and convenience of an outpatient basis procedure make this therapy an exciting option for patients with acne vulgaris. There are some studies which evaluated the different parameters such as wavelength, pulse duration and single and burst pulse mode in the treatment of acne for achieving the best result. However, to the best of our knowledge, there are no studies to compare two different types of fluence on both sides of face, especially in Indian skin. Hence, from the results, it is proven that subnormal fluence is as effective and efficacious as normal fluence used on other side of the face in Indian skin with no serious side effects. Our results suggest that it is effective and safe option for inflammatory acne vulgaris with minimal downtime and reversible side effects. Although the study was done using it as monotherapy, we recommend combination of systemic antibiotics along with it for better and long-lasting results.

**Declaration of patient consent**

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Nil.

**Conflicts of interest**

There are no conflicts of interest.

**What is new?**

Intense pulse light can be used safely in Indian skin. At subnormal fluence it is equally effective in acne vulgaris in Indian skin without any side effects.

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