

Efficacy and safety of blue light versus 4% topical benzoyl peroxide in mild to moderate acne

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Abstract *Objective* To determine the efficacy and safety of blue light in comparison with 4% topical benzoyl peroxide (BPO) in mild to moderate *acne*.

Methods This randomized controlled trial, carried out in the Department of Dermatology at Services Institute of Medical Sciences/Services Hospital, Lahore, included 124 patients age ranging from 14-35 years having mild to moderate acne. Patients were randomized to receive blue light therapy (group I) or topical 4% BPO twice daily (group II). Efficacy was determined at week 8 by comparing % reduction in number of lesions. Side effects were noted during treatment period.

Results Total 124 patients were randomly divided into two groups. Group I, 62 (50%) patients were treated with blue light therapy and group B, 62 (50%) patients were treated with 4% topical BPO. 52 patients were male (41.9%) whereas 72 were females (58.1%). The mean age of the patient was 23.02 ± 6.3 years. The efficacy of the treatment in term of % reduction in the number of lesions was more in blue light group as compared to 4% topical BPO group, (76% vs. 60%), $P < 0.05$. Blue light group was safer as compared to 4% topical BPO group (100% vs. 91%).

Conclusion Blue light is more effective and safe therapy for mild to moderate acne patients as compared to 4% topical benzoyl peroxide.

Key words

Benzoyl peroxide, acnes, blue light

Introduction

Acne vulgaris is a disorder related to sebaceous glands. It is one of the frequent dermatological disorders seen in clinics and leading reason for consultation with dermatologists. Acne mostly appears at the age of 17-21 years and may remit spontaneously after the age of 25 years.¹ The condition presents with a multitude of lesions comprising comedones, papules, pustules and nodules on the face and upper trunk. The severity and extent may vary, from mild comedonal acne to a fulminant, scarring and

systemic condition. The most important consequence is lifelong acne scars on exposed parts of the body especially face.

The treatment of acne depends upon the clinical presentation and its pathophysiological mechanism, like follicular hyperkeratosis, seborrhea, *Propionibacterium acnes* colonization and inflammation. The mild forms of acne are treated by topical therapy. Topical retinoids are used for the treatment of comedonal acne. A combination of topical retinoid and antimicrobial agents are used for the papulopustular acne e.g. azelaic acid, benzoyl peroxide (BPO), antibiotics.² Oral antibiotics combined with topical retinoids or BPO are good options for moderate forms of acne or extra facial involvement.³ Acne conglobata and other severe forms are best treated with oral

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isotretinoin. Oral contraceptives containing antiandrogenic progestins are good treatment options for women showing clinical signs of hyperandrogenism.⁴

Non-pharmacological approaches such as light-based antimicrobial therapies that include photodynamic therapy (PDT) and intense pulse light (IPL) are latest modalities for the patients not responding to antibiotics.⁵

Blue light therapy is also a new light-based approach which is popular nowadays due to its intrinsic antimicrobial effect without any need of exogenous photosensitizers. It is a high-intensity, blue light source with wavelength of 405nm-420nm. The fact is also established that blue light is much less harmful to human cells than UV irradiation.⁶

Topical BPO has antimicrobial, keratolytic and comedolytic properties, with no fear of antibiotic resistance. Topical preparations are currently available at concentrations of 2.5%, 4%, 5%, 10% and 20 %. The effect depends upon the dose of formulations. Acne grade I-II is often controlled by 5% BPO. It can also be combined with other topical therapies like retinoid and antibiotics.⁷

Rationale of our study was to measure the efficacy and safety of blue light versus topical 4% benzoyl peroxide in mild to moderate acne. In Pakistan, common skin types encountered are Fitzpatrick type III and IV and there is also a difference in climate, therefore we are expecting different results.

Methods

After the approval of the Institutional Ethical Committee, 140 patients suffering from mild to moderate acne were selected through Outpatient Department of Dermatology, Services Hospital, Lahore from 15th June to 15th December, 2015. The patients fulfilling the inclusion criteria were registered in the research study after filling and signing an informed consent. Patients with systemic diseases, pregnant and lactating mothers were excluded. Patients with photosensitivity, herpes simplex virus infection on the treatment area, laser resurfacing, chemical peel or dermabrasion within the last 8 weeks and history of previous allergy to benzoyl peroxide or blue light were also excluded. Baseline demographic information such as name, age, sex was noted. Complete general, systemic, and dermatological examinations were performed. Acne was graded as mild acne: < 20 comedones, <15 inflammatory lesions or total lesion count <30; moderate acne: comprises 20-100 comedones, 15-50 inflammatory lesions or total lesion count 30-125.

The patients were randomly divided into two groups I and II by random number table, in which 70 patients in group I were treated with blue light and 70 patients in group II treated with 4% benzoyl peroxide. Patients of group I underwent 12 sessions of blue light therapy for 15 minutes each, twice a week for 6 weeks.

Blue Light emission was obtained using a specific light source (Soret Blue Light®) that illuminated a 55mm circular area, which was externally protected by a spherical non-transparent globe, manufactured for this specific purpose. It produced high intensity light in the range 407nm to 420 nm. This light wavelength is efficient for the photostimulation of porphyrins. The penetration of this light was approximately 1mm into the skin and it reached *P. acnes* that are on the surface and inside the

pilosebaceous ducts. Patients eyes were protected with dark lenses goggles during the sessions. 4% Benzoyl peroxide was prescribed as topical cream, provided in 40g tubes, to be used at night daily for 6 weeks.

Patients were called for 6 visits for measure the efficacy and safety. Recruitment visit, for instructions and selection of cases one week before the beginning of treatment; (V1): Visit for randomization and inclusion of patients eligible for treatment; (V2): first assessment visit at two weeks of treatment; (V3): second assessment visit at four weeks of treatment; (V4): third assessment visit at six weeks of treatment; (V5): fourth assessment visit at 8 weeks of treatment; (V6): fifth assessment visit at 12 weeks of treatment for follow-up only. Starting point and primary end point were the lesions counts done at V1 (baseline/recruitment) and V5 (at week 8, two weeks after last treatment).

Patient's disease severity was assessed by a third observer unaware of the treatment option given. Quantification of acne improvement was made by counting the total number of inflammatory lesions (papules and nodules) and non-inflammatory lesions (comedones) on face at initial visit V1 and visit V5 (week 8). Efficacy was categorized as excellent: >90% reduction; good: 60%-90% reduction; fair: 30%-59% reduction; and poor: <30% reduction. Safety was defined as no major side effects except minimal burning, erythema and dryness on treated skin.

All the data were entered and statistical analysis was performed using statistical package for social sciences software version 21. The quantitative variables like age and number of acne lesions were calculated as mean \pm standard deviation. The qualitative variables like gender and safety were calculated as frequency and

percentages. Chi-square test was used to compare grades of % reduction in the two treatment groups, while for quantitative variables, student t-test was applied. *P* value equal to ≤ 0.05 was considered significant

Results

Out of 140 patients, 124 patients completed the treatment and follow-up. 16 patients were dropped out due to poor compliance or minor side effects of 4% topical benzoyl peroxide. Among 124 patients of mild to moderate acne, male patients were 52 (41.9%) whereas female patients were 72 (58.1%). The mean age of the patient was 23.02 ± 6.329 years. Minimum age was 14 years and maximum age 35 years.

The difference between the two treatments in mean acne lesion was statistically significant ($P < 0.05$) at 6th, 8th, 12th, while at 2nd and 4th week difference was statistically insignificant. In addition, the trend towards mean acne lesion was found to be lower in the blue light group I compared with the topical 4% benzoyl peroxide group B at 2nd, 4th, 6th, 8th, and 12th weeks. The acne lesions improved in both groups whereas improvement was comparatively better in group I ($P < 0.05$).

The difference between the irritation and burning in treatments groups were statistically significant at 2nd, 4th, 6th week ($P < 0.05$). No patient complained of irritations and burning in both groups at 12th week.

The difference between the erythema in treatment groups were statistically significant at 2nd, 4th, 6th, 8th week while insignificant at 12th week ($P < 0.05$).

Table 1 Descriptive and inferential statistics of the demographic characteristics.

	Group I (blue light) N=62	Group II (topical BPO) N=62	P value
Gender			
Male	29 (46.8%)	23 (37.1%)	0.071
Female	33(53.2%)	39(62.9%)	
Mean age (years)	23.40±6.841	22.65±5.803	0.583

BPO=benzoyl peroxide.

Table 2 Comparison of mean acne lesion in treatment groups (blue light versus the 4% topical benzoyl peroxide) at baseline, 2, 4, 6, 8 and 12 weeks.

	Group I (blue light) N=62	Group II (topical BPO) N=62	P value
Baseline	28.08±9.513	27.61±12.45	0.815
2 nd week	26.97±8.959	25.87±11.26	0.550
4 th week	22.40±8.884	21.16±10.65	0.480
6 th week	14.89±5.809	17.89±9.183	0.032
8 th week	14.05±5.367	18.06±9.218	0.004
12 th week	14.05±5.367	18.94±9.888	0.003

BPO=benzoyl peroxide.

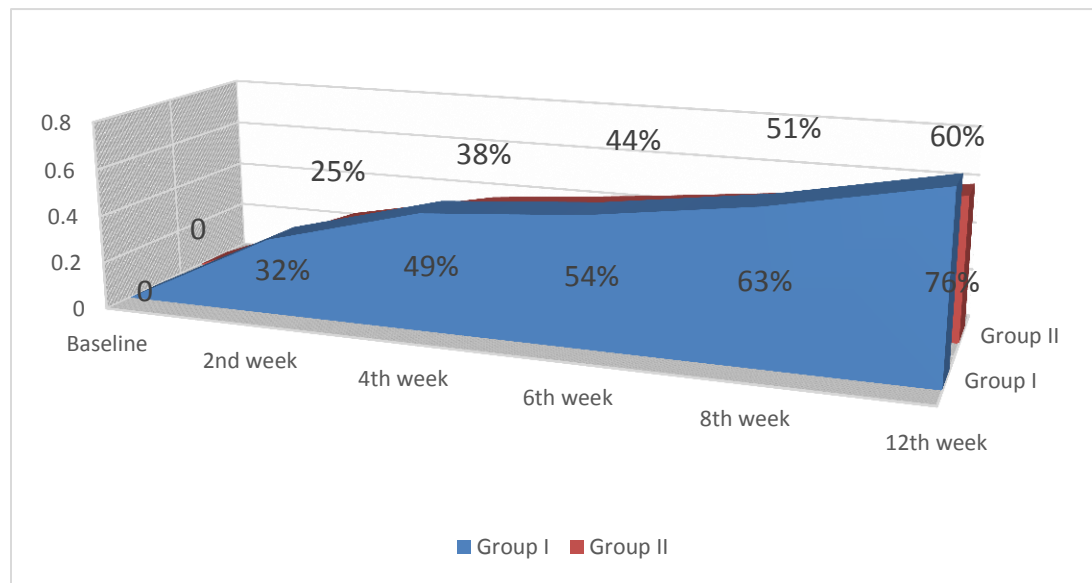


Figure 1 Reduction (%) with respect to treatment group I (blue light) and group II (benzoyl peroxide).

Discussion

Our results showed that out of 124 patients of mild to moderate acne, male patients were 52 (41.9%), whereas females were 72 (58.1%). Wheeland and Koreck (2012)⁸ concluded that acne is more prevalent in female patients compared to male patients (66% vs. 34%). 4% Benzoyl peroxide treated patients were higher in female gender as compared to the blue light. It

indicated that women are at increased risk of P. acne.⁹ Present study demonstrated similar results.

In our study showed that the mean age of our patients was 23.02±6.32 years although the range of minimum to maximum age was 14- 35 years. de Arruda *et al.*¹⁰ (2009) found that the mean age of the patients with acne was (17.3± 2.3) years.

Table 3 Comparison of irritation/ burning and erythema in treatment groups at 2, 4, 6, 8 and 12 week.

		Group I (blue light) N=62	Group II (topical BPO), N=62	P value
Irritation/ burning	Week 2	-	17 (27.4%)	0.214
	Week 4	-	34 (54.8%)	0.012
	Week 6	-	34 (54.8%)	0.016
	Week 8	-	6 (9.7%)	1.00
	Week 12	-	-	
Erythema	Week 2	-	23 (37.1%)	0.001
	Week 4	5 (9.1%)	27 (43.6%)	0.001
	Week 6	5 (9.1%)	33 (53.2)	0.001
	Week 8	-	11 (17.7%)	0.001
	Week 12	-	5 (9.1%)	1.00

BPO=benzoyl peroxide.

Wheeland and Koreck⁸ (2012) observed that mean age of the patients in their study was 20±6.7 years in both groups. The mean age of our research group was 23 years which was close to previous studies.

The acne lesions improved in both groups but the improvement of mean acne lesions between the two treatment groups was more in group I (blue light) 47 (76%) as compared to group II (topical 4% benzoyl peroxide) 37 (60%). In group I, % reduction was observed to be fair at 2-6 weeks while at 8th to 12th weeks the treatment effect was observed to be good (76%). However, in group II, % reduction was observed to be fair at 2-8 weeks while it was good at 12th week (60%). Improvement was more markedly seen in papules and pustules as compared to comedones and nodules. Our results differ from another study which reported remarkable decline in comedones and papules with blue light.¹⁰

Shalita *et al.*¹¹ (2001) found that the blue light improved inflammatory lesions more markedly. Gold *et al.*¹⁴ (2011) analyzed that blue light treatment is efficacious for the treatment of mild to moderate inflammatory acne vulgaris. de Arruda *et al.*¹⁰ (2009) established that the results were same in both treatment groups i.e. blue light and BPO.

Beneficial effect of blue light were endorsed by Ammad *et al.*¹² Similar study conducted by Omi *et al.*¹³ concluded that 64.7% of inflamed lesions were improved. A similar study was conducted in which mild to moderate acne was improved in 8 weeks.¹⁴ Babaeinejad and Fouladi¹⁵ (2013) found that benzoyl peroxide 2.5% gel is less effective than topical adapalene 0.1% gel. Present study demonstrated the similar results.

In our study, blue light was found to be safer in terms of side effects as compared to 4% benzoyl peroxide group. de Arruda LHF *et al.*¹⁰ (2009) established that blue light is safer as compared to 5% benzoyl peroxide group as there were less side effects in the group treated by blue light (23.3%).

Kawashima *et al.*¹⁶ (2014) reported that the safety was not higher in BPO group during baseline to 12th week follow-up (10%). Results showed that all side effects were minimal. Dose-dependent side effects were more in BPO group. Our study also showed that blue light is safer as compared to BPO.

Conclusion

Blue light therapy has a beneficial role in acne with fewer side effects. It is safe and patient favourable. Its gentleness on the skin, offers a

better choice for patients who are unable to use antibiotics or topical irritating therapies.

Topical 4% benzoyl peroxide is also a good treatment option for mild to moderate acne but less effective in controlling inflammatory lesions and also has more side effects such as dryness, irritation, burring and desquamation as compared to blue light therapy.

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