

Original Research Article

Evaluation of the effectiveness of intense pulse light vs topical benzoyl peroxide 2.5% gel in patients of inflammatory acne receiving oral azithromycin pulse therapy: a randomized control trial

Sandeep B. Hade¹, Sumedh R. Khandare², Ganesh S. Narwane^{3*}

¹Department of Dermatology, MIMER Medical College, Talegaon-Dabhade, Pune, Maharashtra, India

²Department of Dermatology, Government Medical College, Akola, Maharashtra, India

³Department of Radio-Diagnosis, MIMER Medical College, Talegaon-Dabhade, Pune, Maharashtra, India

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*Correspondence:

Dr. Ganesh S. Narwane,

E-mail: ganeshnarwane1@gmail.com

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ABSTRACT

Background: Acne vulgaris is a chronic inflammatory condition of the pilosebaceous unit, primarily affecting adolescents and young adults. Conventional treatments, including topical and systemic therapies, often lead to inconsistent outcomes, resistance and poor compliance, contributing to psychological distress and scarring. Light-based therapies, particularly Intense Pulsed Light (IPL), have emerged as effective non-invasive alternatives, improved patient adherence and delivering faster results. Given the limited comparative studies between IPL and benzoyl peroxide 2.5% gel, this study aims to evaluate their efficacy in treating inflammatory acne.

Methods: This randomized controlled trial was conducted at the Department of Dermatology, Venerology and Leprosy of a tertiary care center, Akola, between January 2020 to June 2021 enrolling 60 patients who met specific inclusion and exclusion criteria. Patients were randomly assigned to IPL therapy or topical benzoyl peroxide 2.5% gel, with both groups receiving oral azithromycin 250 mg thrice weekly for two months. Lesion assessment was performed using the Michaelson Severity Index (MSI), along with erythema grading and photographic analysis.

Results: The results showed greater improvement in lesion severity with IPL, with higher moderate and good resolution at the 4th sitting compared to benzoyl peroxide. Although IPL patients experienced more transient erythema (32%), they had fewer overall adverse effects. Statistical analysis confirmed significant improvements in acne severity with IPL, indicating superior effectiveness in reducing inflammatory acne lesions.

Conclusions: IPL showed superior efficacy in reducing inflammatory acne with fewer adverse effects.

Keywords: Intense pulse light, Inflammatory acne, Oral azithromycin pulse therapy, Topical benzoyl peroxide 2.5% gel

INTRODUCTION

A precise definition of acne vulgaris is difficult to frame. It can be defined as a chronic, self-limiting, inflammatory disease of the pilosebaceous unit, manifesting generally in adolescence with pleomorphic lesions like comedones, papules, nodules and cysts. Acne vulgaris is a very

common condition affecting adolescents and young adults.^{1,2} Topical treatments for acne vulgaris include retinoids, benzoyl peroxide and antibiotics (clindamycin, nadifloxacin, erythromycin, dapsone). Other widely used agents are azelaic acid, salicylic acid, sulfur, alpha hydroxyl acids (glycolic, salicylic) and picolinic acid, offering diverse therapeutic options. Systemic therapy for

acne includes antibiotics such as tetracycline, doxycycline and azithromycin, along with hormonal treatments like estrogen and antiandrogens. Oral isotretinoin is used for severe cases, while physical modalities like chemical peeling, laser therapy and acne surgery help in resistant cases. However, treatment outcomes vary due to resistance and poor compliance, leading to complications like scarring, psychological distress and reduced self-esteem, necessitating effective interventions.^{3,4}

Acne vulgaris is a chronic inflammatory disease affecting adolescents and young adults worldwide, significantly impacting social and psychological well-being. Though considered a physiological condition, its inflammatory nature and facial disfigurement make it a clinically significant disorder. The prevalence is high across all races, with urban populations and smokers experiencing more severe cases in India.^{5,6}

Traditional topical and systemic treatments often lead to adverse effects and resistance, prompting increased interest in light-based therapies, particularly Intense Pulsed Light (IPL), which has shown promise in reducing inflammatory acne lesions.⁷⁻¹⁰ However, comparative studies between IPL and benzoyl peroxide 2.5% gel remain insufficient, warranting further investigation. This study evaluates IPL's effectiveness against benzoyl peroxide 2.5% gel in inflammatory acne treatment.

METHODS

Following ethical approval, this randomized controlled trial was conducted at the Department of Dermatology, Venerology and Leprosy of a tertiary care center, Akola, between January 2020 to June 2021. A total of 60 clinically diagnosed inflammatory acne patients were enrolled based on specific inclusion and exclusion criteria, with written informed consent obtained from each participant. Patients were randomly allocated into two treatment groups using a random number table method: Group A, which received Intense Pulsed Light (IPL) therapy and Group B, which was treated with topical benzoyl peroxide (2.5%) Gel.

Both groups were administered oral azithromycin (250 mg) thrice weekly for two months as adjunct therapy. Baseline assessments included lesion count, erythema grading and the Michaelson Severity Index (MSI) score, alongside photographic analysis. IPL patients underwent four biweekly sessions, with fluence adjusted based on Fitzpatrick skin type, while benzoyl peroxide was applied nightly. Follow-ups occurred every two weeks, where clinical assessments, photographic evaluations and patient self-assessment ratings were documented. Statistical analysis was performed using SPSS 26, utilizing paired and unpaired t-tests to assess the treatment efficacy and compare outcomes. This methodological approach ensured a scientific and valid comparison between IPL and benzoyl peroxide for

treating inflammatory acne, aiming to establish an optimal therapeutic strategy for acne management.

RESULTS

Demographic findings

This study involved 60 patients, evenly divided into Group A (IPL therapy) and Group B (Topical Benzoyl Peroxide 2.5% Gel) (Table 1). Most participants were 21–25 years old (68%), with a mean age at presentation of 23.30 ± 3.553 years and a mean age of acne onset at 17.68 ± 1.823 years. The average acne duration was 2.90 ± 1.613 years, indicating chronic cases.

The patient distribution reflected a male predominance (82%), with 84% being unemployed. This suggests a significant impact of acne on young individuals entering adulthood and the workforce. Additionally, 62% were urban residents, reinforcing environmental and lifestyle factors contributing to acne severity.



Figure 1: Group A: IPL. (A) At baseline (1st visit) and B) after 4 sitting (after 8 weeks).



Figure 2: Group B: treatment with 2.5% benzoyl peroxide gel. (A) At baseline (1st visit) and (B) after 4 sittings (after 8 weeks).

Acne severity and treatment response

Acne severity was assessed using the Michaelson Severity Index (MSI). The majority of patients had moderate acne (MSI score: 21–30), accounting for 62% of cases, while 16% had severe acne with an MSI score above 30 (Table 2).

Following treatment, IPL therapy demonstrated greater improvement in acne severity compared to benzoyl peroxide gel. At the fourth sitting, 41.6% of IPL patients showed moderate resolution and 16.6% showed good resolution, compared to 20% moderate resolution and 12% good resolution in the benzoyl peroxide group (Table 3). The photographic assessment by independent observers confirmed these results, showing higher rates of lesion improvement in IPL patients (Table 4).

Statistical analysis and adverse effects

Paired t-tests indicated significant reductions in MSI scores for both groups ($p < 0.0001$), confirming the effectiveness of both treatments (Table 5, Table 6). However, IPL demonstrated greater lesion reduction with higher improvements in subjective and photographic analysis. Adverse effects were mild and transient, with IPL causing more cases of transient erythema (32%) compared to benzoyl peroxide (16%). However, no persistent erythema, blisters, edema or pigmentation were observed, reinforcing IPL as a safe treatment modality with a favorable tolerance profile.

Table 1: Distribution of study patients according to age in years (N=60).

Age group (in years)	Number of patients		
	Group A (IPL)	Group B (Topical BPO 2.5% GEL)	Total (%)
≤ 20	04	05	09 (16)
21-25	23	17	40 (68)
26-30	02	05	07 (12)
31-35	01	01	02 (2)
36-40	00	02	02 (2)
Total	30	30	60 (100)

*Percentage calculated column-wise. Most patients are aged 21-25 years, followed by smaller proportions in younger and older age groups. Both treatment groups are evenly distributed, ensuring balanced age representation.

Table 2: Distribution of study patients according to Michaelson severity index (MSI SCORE) (N=60).

Michaelson severity index (MSI Score)	Number of patients		
	Group A (IPL)	Group B (Topical BPO 2.5% GEL)	Total (%)
10-20	08	07	15 (22)
21-30	18	17	35 (62)
31-40	04	06	10 (16)
Total	30	30	60 (100)

*Percentage calculated column-wise. The 21-30 MSI score range has the highest number of patients, comprising 62% of the total sample, followed by 10-20 and 31-40 severity categories. Both treatment groups have a comparable distribution across severity levels, ensuring a balanced assessment of intervention effectiveness.

Table 3: Subjective analysis at 2nd and 4th sitting follow-up.

Subjective analysis	Number of patients (%)			
	2nd sitting follow-up		4th sitting follow-up	
	Group A (IPL) 2nd sitting follow-up (n=30)	Group B (Topical BPO 2.5% GEL) 2nd sitting follow-up (n=30)	Group A 4th sitting follow-up (n=30)	Group B (Topical BPO 2.5% GEL) 4th sitting follow-up (n=30)
No resolution (0)	7 (28)	6 (20)	0	0
Mild resolution (1)	10 (32)	15 (54)	13 (41.6)	21 (68)
Moderate resolution (2)	11 (36)	6 (20)	13 (41.6)	6 (20)
Good resolution (3)	2 (4)	3 (6)	4 (16.8)	3 (12)
	p=0.488		p=0.141	

*Percentage calculated column-wise. At the 2nd sitting follow-up, Group B showed more mild resolution, while Group A had higher moderate resolution. By the 4th sitting, both groups improved, with Group A showing more moderate and good resolution, though differences were not statistically significant.

Table 4: Photographic analysis by observers at the 2nd and 4th sitting follow-up.

Photographic analysis	Number of patients (%)			
	2nd sitting follow-up		4th sitting follow-up	
	Group A (IPL) 2nd sitting follow-up (n=30)	Group B (Topical BPO 2.5% GEL) 2nd sitting follow-up (n=30)	Group A 4th sitting follow-up (n=30)	Group B (Topical BPO 2.5% GEL) 4th sitting follow-up (n=30)
No resolution (0)	0	0	2 (8)	2 (7)
Mild resolution (1)	23 (77)	26 (84)	14 (46)	23 (77)
Moderate resolution (2)	7 (23)	2 (8)	14 (46)	5 (16)
Good resolution (3)	0	2 (8)	0	0
	p=0.372		p=0.245	

*Percentage calculated column-wise. At the 2nd sitting, most patients showed mild resolution, with Group A having more moderate cases. By the 4th sitting, Group A saw increased moderate resolution, while Group B retained a higher mild resolution.

Table 5: Association of various parameters at the start of the study and follow-up with modality of IPL (paired t Test).

Parameter	Timing of check up	Mean/Median	Standard deviation	t value	P value
Subjective analysis	2nd sitting follow-up	1.00	0.898	5.214	<0.0001
	4th sitting follow-up	1.00	0.526		
Photographic analysis	2nd sitting follow-up	2.00	0.737	3.715	0.001
	4th sitting follow-up	1.50	0.511		
MSI SCORE	Baseline	15.24	5.372	6.266	<0.0001
	2nd sitting follow-up	23.96	5.232		
MSI SCORE	Baseline	24.96	5.295	12.477	<0.0001
	4th sitting follow-up	21.83	5.172		
MSI SCORE	2nd sitting follow-up	23.96	5.232	9.700	<0.0001
	4th sitting follow-up	21.83	5.172		

The paired t-test shows significant improvement across all parameters, with subjective and photographic analysis indicating better resolution by the 4th sitting. The MSI score also demonstrates a notable reduction over time, confirming the effectiveness of IPL treatment ($p<0.0001$).

Table 6: Association of various parameters at the start of the study and follow-up with modality of TOPICAL 2.5% BPO GEL (Paired t Test).

Parameter	Timing of check up	Mean / Median	Standard Deviation	t value	P value
Subjective analysis	2nd sitting follow-up	1.00	0.707	3.773	0.001
	4th sitting follow-up	1.00	0.408		
Photographic Analysis	2nd sitting follow-up	1.00	0.712	2.874	0.008
	4th sitting follow-up	1.00	0.557		

Continued.

Parameter	Timing of check up	Mean / Median	Standard Deviation	t value	P value
MSI score	Baseline	25.96	7.050	4.082	<0.0001
	2nd sitting follow-up	24.96	6.445		
MSI score	Baseline	25.96	7.050	9.625	<0.0001
	4th sitting follow-up	22.44	6.138		
MSI score	2nd sitting follow-up	24.96	6.445	9.982	<0.0001
	4th sitting follow-up	22.44	6.138		

The paired t-test indicates significant improvement with Topical 2.5% BPO Gel, showing better subjective and photographic resolution by the 4th sitting. The MSI score also declines over time, confirming its effectiveness ($p < 0.0001$).

DISCUSSION

Acne vulgaris, a chronic inflammatory disease of the pilosebaceous unit, significantly affects adolescents and young adults, causing physical and psychological distress. This study compared the efficacy of Intense Pulsed Light (IPL) therapy combined with azithromycin pulse therapy versus topical benzoyl peroxide (BPO) 2.5% gel with azithromycin pulse therapy for managing inflammatory acne.

Patient characteristics

A total of 60 patients with inflammatory acne were included, equally randomized into two groups. Most participants (68%) were aged 21–25 years, with a mean age of 23.30 ± 3.553 years at presentation. Acne onset occurred at a mean age of 17.68 ± 1.823 years, with an average duration of 2.9 ± 1.613 years. Most participants were male (82%) and unmarried (96%). At baseline, 62% of patients had MSI scores between 21–30, indicating moderate disease severity.

Efficacy of treatment modalities

IPL therapy (Group A)

Patients receiving IPL showed a reduction in MSI scores from 25.96 ± 7.050 at baseline to 22.44 ± 6.138 after four sittings. Subjective analysis revealed mild or moderate resolution in 83.2% of patients and good resolution in 16.6%. Observer-based photographic analysis supported these findings, noting mild and moderate resolution in 50% of cases each. Prior studies by Elman et al and Dierickx also reported IPL's effectiveness, with lesion clearance rates of 72% for non-inflammatory and 50% for inflammatory acne.^{11,12}

BPO 2.5% gel therapy (Group B)

Topical BPO gel reduced MSI scores from 25.24 ± 5.372 at baseline to 21.83 ± 5.172 after four sittings. Mild resolution was reported by 68% of patients, moderate resolution by 20% and good resolution by 12% in subjective analysis. Photographic evaluation noted mild resolution in 72% and moderate resolution in 24%. Benzoyl peroxide's antimicrobial and anti-inflammatory properties explain these results.^{13,14}

Comparative analysis

Statistical tests revealed no significant difference between the two modalities in terms of overall efficacy ($p > 0.05$). While IPL demonstrated slightly earlier improvement, BPO gel was equally effective over time.

Safety profile

Transient erythema was the most common adverse event, reported in 32% of IPL patients compared to 16% of BPO gel patients. No persistent erythema or severe side effects were observed.

Both Intense Pulsed Light (IPL) therapy and topical benzoyl peroxide (BPO) 2.5% gel combined with azithromycin pulse therapy demonstrated comparable efficacy in reducing inflammatory acne severity, as reflected by significant reductions in Michaelson Severity Index scores. While IPL exhibited slightly earlier clinical improvements, the difference was not statistically significant and both modalities showed similar resolution outcomes over the treatment period. The safety profiles of both therapies were favorable, with transient erythema reported more frequently in the IPL group. IPL presents a viable non-topical alternative, particularly for patients intolerant to benzoyl peroxide; however, its higher rate of transient adverse effects warrants careful patient selection. Future research involving larger, randomized trials with extended follow-up periods and advanced quantitative assessment techniques is essential to validate these findings and establish long-term outcomes. These results affirm the utility of both IPL and BPO gel as effective options for managing inflammatory acne.

The study's limitations include a small sample size, COVID-19-related attrition, short follow-up duration, demographic bias toward young males, subjective improvement assessments, focus on transient effects and single-center design. Larger multicenter trials, longer follow-up periods and advanced imaging techniques are needed to strengthen findings and evaluate long-term outcomes comprehensively. Larger randomized controlled trials with more treatment sessions, extended follow-up and advanced techniques like three-dimensional skin imaging are needed to validate the efficacy and safety of both modalities, including assessing adverse effects like erythema, edema and

blistering and improving the precision of acne severity assessments.

CONCLUSION

Intense Pulsed Light (IPL) therapy demonstrated slightly superior clinical improvement and faster response in managing inflammatory acne compared to benzoyl peroxide 2.5% gel, both used alongside oral azithromycin. Despite transient erythema in IPL cases, both treatments were safe and effective, offering viable options for individualized acne management strategies.

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REFERENCES

1. Lever L, MR. Current views on the etiology, pathogenesis and treatment of acne vulgaris. *Drugs*. 1990;39:681-92.
2. Chan JJ, Rohr JB. Acne vulgaris: yesterday, today and tomorrow. *Australasian J Dermatol*. 2000;41:69-72.
3. Yeung CK, Teo LH, Xiang LH, Chan HH. A community-based epidemiological study of acne vulgaris in Hong Kong adolescents. *Acta dermato-Venereologica*. 2002;82(2):875.
4. Gupta MA, Gupta AK. Depression and suicidal ideation in dermatology patients with acne, alopecia areata, atopic dermatitis and psoriasis. *The British J Dermatol*. 1998;139(5):846-50.
5. Cotterill JA, Cunliffe WJ. Suicide in dermatological patients. *Br J Dermatol* 1997;137:246-50.
6. Ross EV. Optical treatments for acne. *Dermatol Ther*. 2005;18:253-66.
7. Ciocon DH, Boker A, Goldberg DJ. Intense pulsed light: what works, what's new, what's next. *Facial Plastic Surg*. 2009;25(05):290-300.
8. Patidar MV, Deshmukh AR, Khedkar MY. Efficacy of intense pulsed light therapy in the treatment of facial acne vulgaris: Comparison of two different fluences. *Indian J Dermatol*. 2016;61(5):545.
9. Kjeldstad B. Different photoinactivation mechanisms in *Propionibacterium* acnes for near-ultraviolet and visible light. *Photochem Photobiol*. 1987;46(3):363-6.
10. Monroe H. Acne cures from the past. Available at <http://www.ehow.com/way>. Accessed on 2013 January 2025.
11. Poli F, Dreno B, Verschoore M. An epidemiological study of acne in female adults: Results of a survey conducted in France. *J Eur Acad Dermatol Venereol*. 2001;15:541-5.
12. Goodman GJ. Management of post-acne scarring: What are the options for treatment. *Am J Clin Dermatol*. 2000;1:3-17.
13. Chalker DK, Shalita A, Smith JG, Swann RW. A double – blinding Study of the effectiveness of a 3% erythromycin and 5% benzoyl peroxide combination in the treatment of acne vulgaris. *J Am Acad Dermatol*. 1983;9:933-6.
14. Lyons RE. Comparative effectiveness of benzoyl peroxide and tretinoin in acne vulgaris. *Int J Dermatol*. 1978;17:246–51.

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