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COMBINED 400-600 NM AND 800 -1200 NM INTENSE PULSED PHOTO THERAPY FOR FACE ACNE VULGARIS IN CHINESE PATIENTS - A PROSPECTIVE STUDY

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Abstract:

Objective: This study investigates the potential efficacy of intense pulsed phototherapy (IPP) within two specific wavelength ranges (400-600 nm and 800-1200 nm) as a novel therapeutic approach for managing mild-to-moderate instances of acne vulgaris affecting the facial region. The efficacy of intense pulsed light (IPL) against P. acnes and its potential soothing effects on the skin prompted our investigation into its safety for this specific use.

Materials and Methods: In a prospective study conducted at a single site, 15 patients with Fitzpatrick skin types III-IV and mild-to-moderate facial acne vulgaris received five IPL treatments using a dual- band "notch" acne filter (Lumenis M22 System) at 1–4 week intervals. The Pictures were taken for Assessment before the treatment and after the 5 session of treatment was performed, the evaluation included the 5-point Global Aesthetic Improvement Scale (GAIS) for acne severity, lesion counts, and overall appearance improvements, as well as Cardiff Acne Disability Index (CADI) questionnaire responses, satisfaction ratings, and pain.

Results: The GAIS scores show that dual-band phototherapy greatly enhanced the cosmetic outcomes. Average GAIS scores decreased from 3.07 ± 0.22 to 2.07 ± 0.29 after the first week of treatment (5 sessions) and they remained significantly lower after a month (mean GAIS 0.47). Significant improvements in acne-related impairment were also shown by the CADI scores, which dropped from a baseline value of 9.47 ± 7.64 to 7.0 ± 5.29 after one week and further to 4.73 ± 3.09 after Four weeks. These findings demonstrated the significant psychological and cosmetic benefits of dual-band phototherapy.

Conclusion: Using IPL equipment with a "notch acne filter," this study shows significant acne vulgaris lesions reduction. Additionally, the treatment was safe and well-tolerated. These data support dual-band IPL therapy for mild-to-moderate facial acne vulgaris, improving aesthetic appearance and psychosocial well-being.

Keywords: Acne Vulgaris, Intense Pulsed Phototherapy, IPL, Chinese Patients, Laser therapy, Cosmetic dermatology, Skin Tones.

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1. INTRODUCTION

Acne vulgaris is a persistent and crippling skin condition that affects 85% of all young people worldwide [1]. In addition to physical discomfort and impairment, many illnesses can result in emotional suffering and a loss of self-worth. In addition to the more common inflammatory papules, pustules, cysts, and nodules, acne is a complex disease of the pilosebaceous unit that also includes non-inflammatory comedons (i.e., blackheads) and inflammatory comedons (i.e., whiteheads). It might be challenging to predict how an outbreak of acne will progress [2, 3]. Even though there are several common remedies for acne, many people still struggle to control their condition. Since there are several issues with current acne treatments, such as antibiotic resistance, short-term efficacy, possible side effects, and teratogenecity [4], the search for alternatives that have more compliance and longer-lasting success should continue. IPL (intense pulsed light) devices are one example of a novel treatment that may be effective [5, 6]. Propionibacterium acnes (P. acnes), swelling, and excessive follicular epidermis growth are the main contributors to acne [7].

Piccolo et al. (2022) [9] investigated the efficacy, safety, & repeatability of a novel IPL technique when employed as monotherapy for the treatment of acne on the chest & back. At the time of enrolment (ages 14–30), all participants in this study exhibited moderate papulopustular acne on their backs & chests. Each patient received four IPL treatments over the course of two weeks. The majority of patients—about two thirds—had favorable results, with half exhibiting outstanding improvement. The most frequent adverse effects were temporary erythema and mild skin burning, but they went away on their own within 24 to 96 hours. In 85% of patients, intense pulsed light (IPL) therapy was successful in treating severe chest and back acne. Ryu et al. (2022) [10] investigated the efficacy & safety of IPL therapy utilizing a dual - band filter (400- 600 nm & 800-1200 nm) for the treatment of acne vulgaris on the face. There were 23 acne vulgaris patients who took part in the study. The patient's appearance was important to both parties. Over the course of two weeks, there were two sessions, each lasting 50 minutes. The patient underwent a final clinical assessment two weeks after the 5th therapy session. Both the melanin index and the average number of papules, pustules, & comedones decreased noticeably from the previous session. The therapy had no effect on the erythema index or sebum production.For people who have received only patchy relief from oral or topical acne medications, intense pulsed light (IPL) therapy with a dual- band filter may be helpful. Chen et al. (2019) [12] performed the efficacy & safety of a novel IPL filter for treating inflammatory acne lesions at wavelengths between 400 and 600 nm & 800 and 1,200 nm. At the subsequent consultation, Hayashi assessed the severity of the acne and discovered a statistically significant improvement (P =.022). The patients felt much better about their own progress. Thanks to the groundbreaking IPL filter at wavelengths of 400-600 nm & 800- 1,200 nm, patients with Pillsbury I-II acne now have a new treatment option with minor reversible side impacts, including as temporary post-inflammatory pigmentation. Existing

literature has extensively analyzed the efficacy of IPL therapy for treating acne vulgaris; however, there is a significant research void in the context of 400-600 nm & 800- 1200 nm combined intense pulsed phototherapy for facial acne vulgaris in Chinese patients. Despite the fact that various researches have investigated the efficacy of IPL therapy utilizing different wavelengths & fluences, the vast majority of these studies focus on diverse populations and disregard the nuances of Chinese skin types. In addition, despite the fact that the outcomes of IPL therapy in terms of lesion reduction & patient satisfaction have been documented, the comparative efficacy of this combined wavelength approach relative to other treatments commonly used in

Chinese patients with acne, such as traditional topical agents or systemic medications, remains unexplored. Consequently, there is a clear need for a comprehensive prospective study examining the effect of combined 400-600 nm & 800-1200 nm intense pulsed phototherapy on facial acne vulgaris in Chinese patients, taking into account clinical efficacy, patient preferences, & potential adverse effects.

New light-based therapy techniques have been developed as a result of recent advances in acne biology and patient demand for improvement. The FDA has approved using intense pulsed light (IPL) to treat specific skin conditions [8]. A spectrum of light emitted by IPL devices has been demonstrated to kill acne-causing bacteria like Propionibacterium acnes, constrict blood vessels, and lessen inflammation. It has been demonstrated that intense pulsed light (IPL) is beneficial in treating both acne & the persistent erythema that acne generates. IPL treatment's efficacy might be increased. A novel IPL filter with a wavelength between 400- 600 nm and 800-1,200 nm may be used to treat acne lesions more effectively.

2. MATERIALS AND METHODS:

Hospital has provided only 15 people who underwent these operations were properly apprised of all the advantages and risks involved. Before incorporating individuals in the study, we made sure to get their informed consent.

2.1. Inclusion and exclusion criteria

Patients who used oral retinoids, had keloids or photosensitivity in the past, were currently dealing with a skin infection, had undergone laser therapy within the last year, or had a history of any of these conditions were not assessed. Women were not allowed to participate if they were pregnant or nursing.

2.2. Patients

Participants required being between the ages of 15 and 45, having skin types III-IV, and have been identified as having mild to severe inflammatory facial acne vulgaris, grade 2-3 on the Global Aesthetic Improvement Scale (GAIS), with at least 15 inflammatory papules or pustules. Use of oral, topical, or systemic antibiotics within two weeks of enrollment, use of steroids within six months of the trial, pregnancy, lactation &/or a history of photosensitivity were all regarded as exclusion criteria. Every patient was thoroughly screened & their medical historywas recorded prior to starting therapy. After receiving crucial information, all trial participants provided their written consent.

2.3. Light source

The M22 system (Lumenis Ltd., Yokneam, Israel) contained a dual-band "notch" filter that allowed it to emit non-coherent blue-to-yellow and near-infrared (IR) light over a 15x35 mm spot size, with fluences of 10-32 J/ cm2; it was CE-marked & FDA-cleared. The fluence in this study ranged from 11 to 15 J/cm2, the pulse duration was 3.5 to 4.5 msec, & the interpulse delays were 25 to 35 msec. A two-stage pass across the whole face was used in the majority of treatments. Spot tests were conducted, and results were monitored for up to three days. Patients had to be excluded from the study due to severe cutaneous reactions.

2.4. Study design

We carried out five total full-face IPL treatments at 1- to 4-week intervals according to the patiets skin conditions and availability. Patients were seen for follow- up treatment again a week and four weeks after the final session (5th Treatment). Before starting therapy, the patient's face was gently cleaned of any makeup, including lip gloss and eye shadow. Eye protection was carefully maintained at all times throughout the procedure. In order to prevent mechanical injury to their skin (friction, squeezing) between treatments, all participants were instructed to wash their faces with lukewarm water, moisturize, and refrain from touching their faces. Throughout the course of the experiment, patients were instructed to reduce their time spent in direct sunlight and to routinely wear broad-spectrum sunscreen (SPF≤30).

The investigator and patient evaluated overall improvements in appearance over the course of treatment using a 5-point GAIS scale, where "5" indicates "worse," "4" indicates "no change, "3" indicates "improved," "2" suggests "much improved," and "1" indicates "very much improved." The Cardiff Acne Disability Index (CADI), which measures the detrimental consequences of acne on everyday functioning and ranges from 0 to 15, was also completed by participants. The CADI questionnaire was also completed at the 1-week and 4-week checks following Treatment 4. At Treatment 4, as well as after one week and four weeks, patients were asked to rate how satisfied they were with the course of treatment. The participants' pain was scored on a 10-point visual analogue scale throughout the study, and the researchers recorded 1 week after treatment & at the 1-month follow-up appointment reactions.

3. Results

The 15 participants' demographics are depicted in Table 1. They had a mean age of 28.8 ± 6.3, were primarily female (75%), & had skin types III (40%) and skin types IV (60%) on average. Only 15 of the original 15 patients were monitored all the way through their treatment. All patients underwent test-

spot procedures prior to beginning treatment, and no one required anesthesia of any type.

Table 1: Patient Demographics and Baseline Characteristics

N=15	
Age, Mean (SD)	28.8 (6.34)
Gender	
Female	12 (75)
Male	3 (25)
Race, n (%)	
Chinese	15(100)
Skin Type, n (%)	
III	8 (40)
IV	12 (600)

A statistically significant (P<0.0001) decrease in overall lesion incidence was also observed. Last time we checked it, the average GAIS score was 3.0 ± 2.532 (Table 2). Images taken both before and after treatment (Fig. 1) illustrate these results. In addition, patient- reported CADI improved over the course of treatment and follow-up visits, with average decreases from baseline of 9.27 ± 7.64 points at 1-week follow-up (P=0.00000001) & 4.73 ± 3.09 points at 5 weeks follow-up (P<0.0000001) (Table 3).

Table 2: Improved Investigator Global Aesthetic Improvement Scale following Dual Band Phototherapy of Acne Vulgaris

Global Aesthetic Improvement Scale (GAIS)		
	Mean (SD)	p-value
1W FU; n=15	3.0 (0.22)	2.532 (0.19)
1M FU; n=15	0.47	0.42

Table 3: Improved Investigator Cardiff Acne Disability Indexes (CADI) following Dual Band Phototherapy of Acne Vulgaris

Cardiff Acne Disability Indexes (CADI)			
	Mean (SD)	Mean (SD) Change from baseline	p-value
Baseline; n=15	2.467 (1.139)	----	---
1W FU; n=15	-2.467 (1.139)	2.267 (1.139)	0.0000001
5W FU; n=15	-4.733 (1.139)	-2.267 (1.39)	0.0000001

Fig 1.1. (A) Chinese Female age 28 skin type-iii treated for acne vulgaris; (B) Four weeks after the final combined400-600nm and 800 -1200 nm intense pulsed photo therapy session.

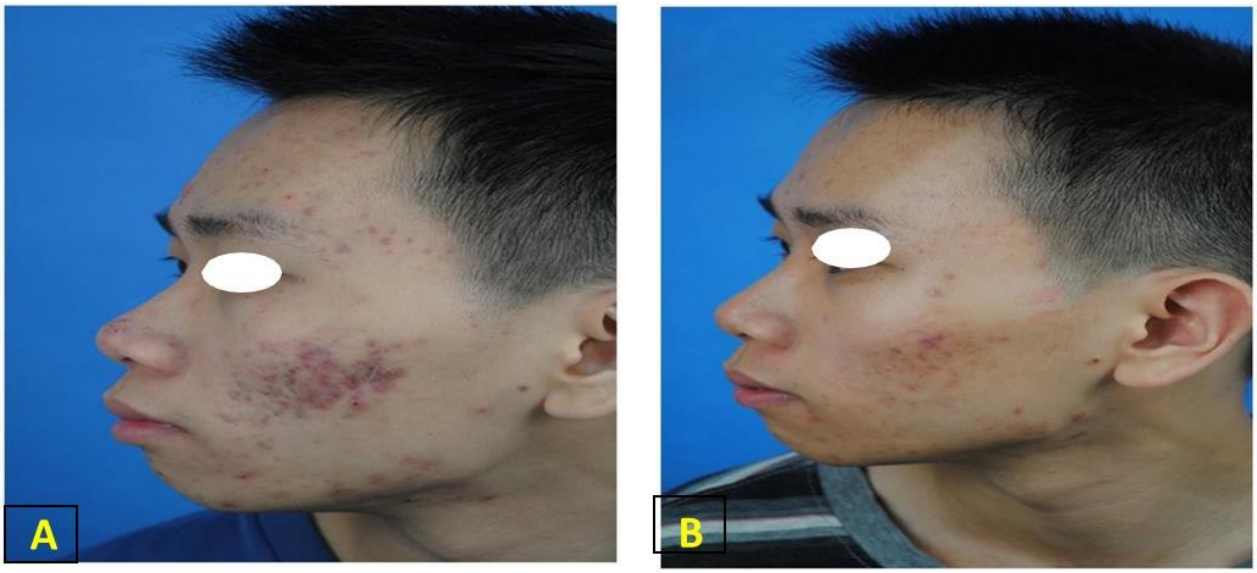

Fig 1.2. (A) Chinese male age 22 skin type-iv treated for acne vulgaris (B) Four weeks after the final combined 400-600nmand 800-1200 nm intense pulsed photo therapy session.

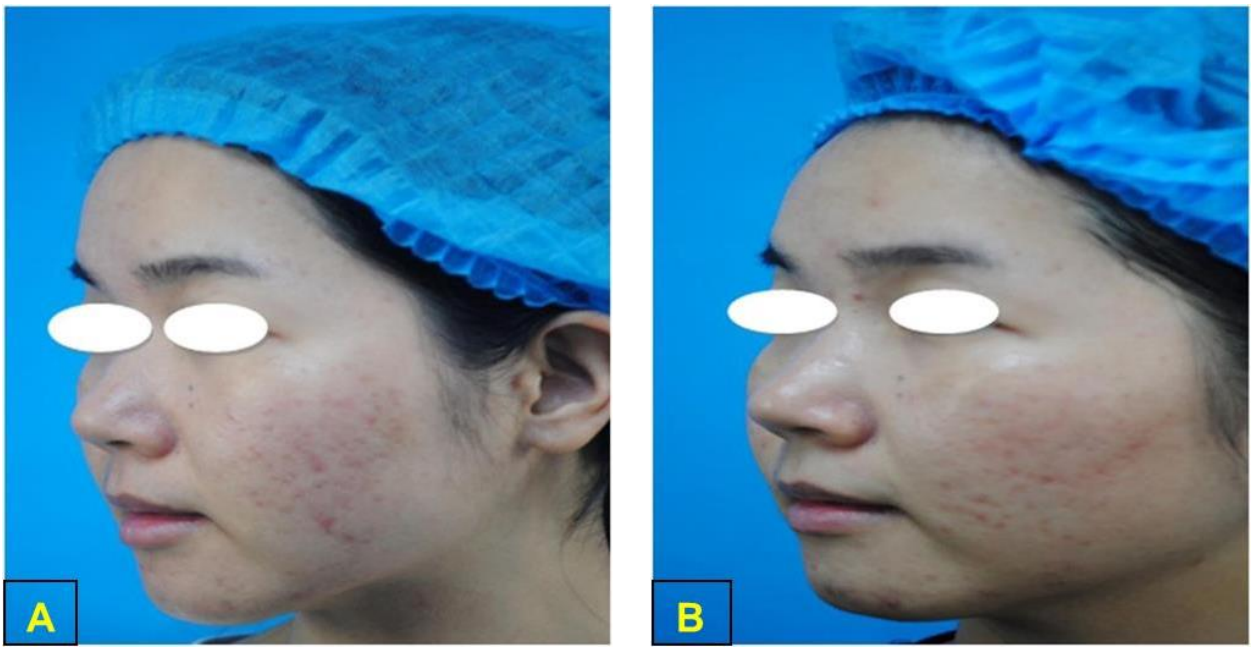

Fig 1.3. (A) Chinese Female age 24 skin type-iii treated for acne vulgaris (B) Four Weeks after the final combined 400-600 nm and 800 -1200 nm intense pulsed photo therapy session.

Fig 1.4. (A) Chinese Female age 36 skin type-iv treated for acne vulgaris (B) Four Weeks after the final combined 400-600 nm and 800 -1200 nm intense pulsed photo therapy session.

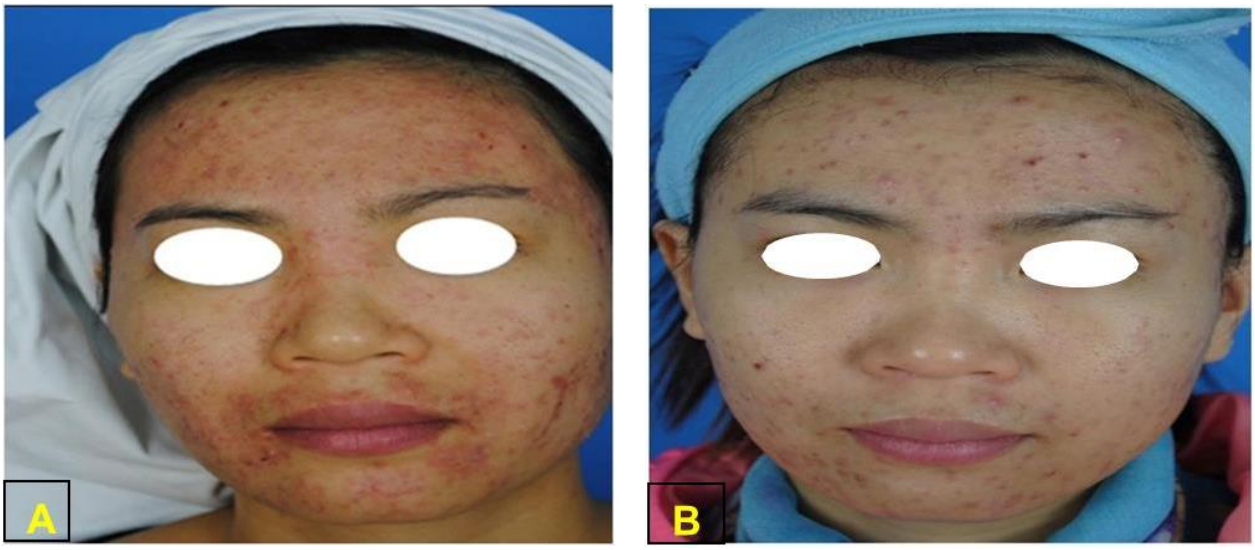

Fig 1.5. (A) Chinese Female age 32 skin type-iv treated for acne vulgaris (B) Four Weeks after the final combined 400-600nm and 800 -1200 nm intense pulsed photo therapy session.

6.67 % of patients reported an improvement or a significant improvement in their skin's texture after Four Weeks (Fig. 2; follow-up). The subject's improvements were statistically significant at both follow-up visits. Additionally, at 4 weeks of follow-up, 86.67% of patients indicated that their skin had improved anywhere from "improved" to "very much improved" (Fig. 3). Eighty percent of patients reported being satisfied with the outcomes of their treatment (Fig. 4). By the end of the trial, 93.33 % of patients considered their lession to be a "minor problem" (Figure 5).

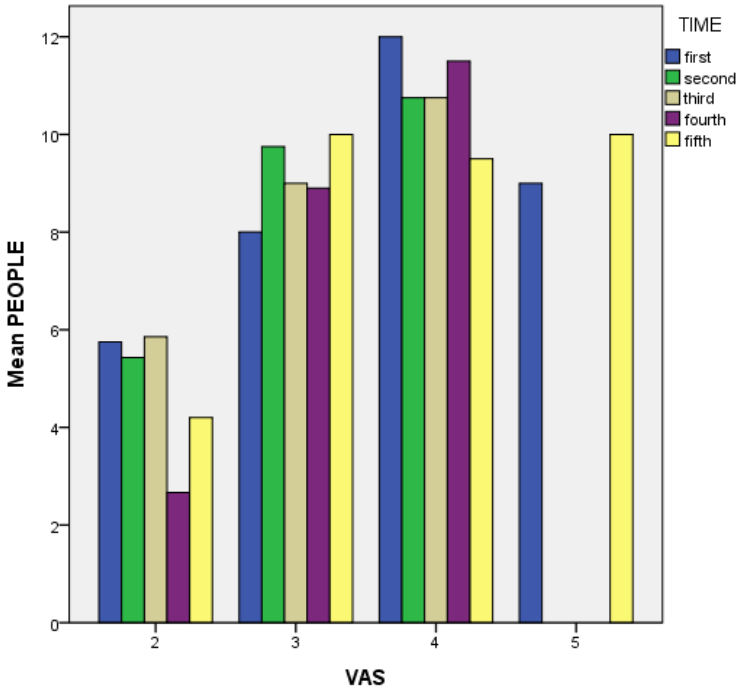

Fig 2. Skin Texture Improvement Score Distributions

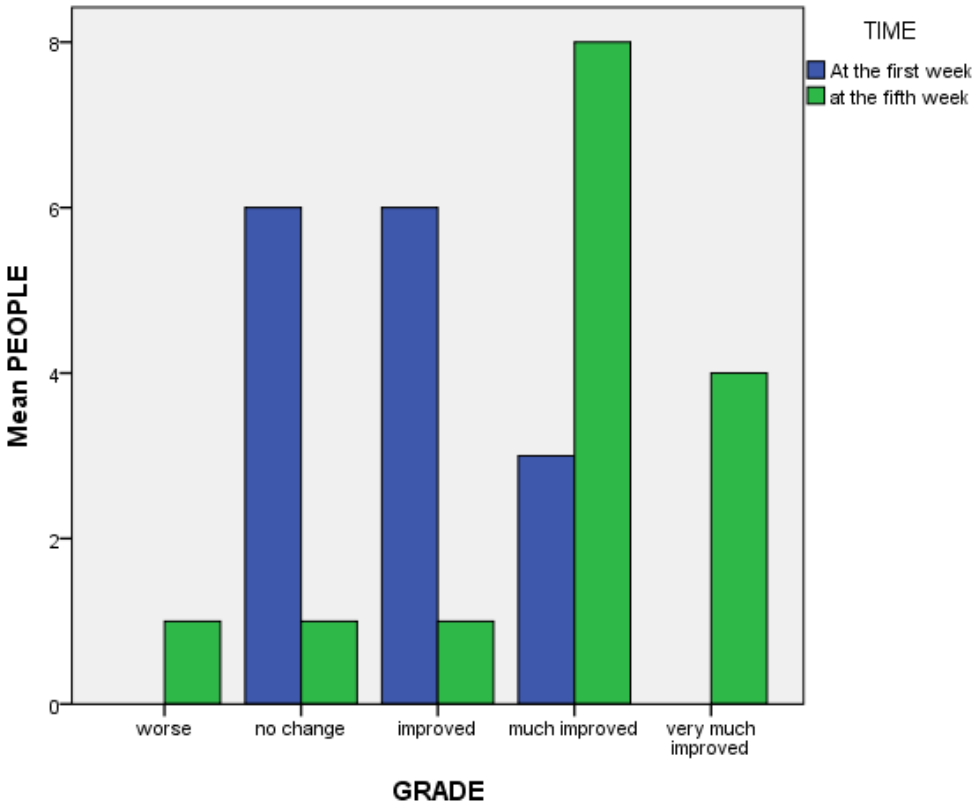

Fig. 3: Overall Self Improvement Score Distributions

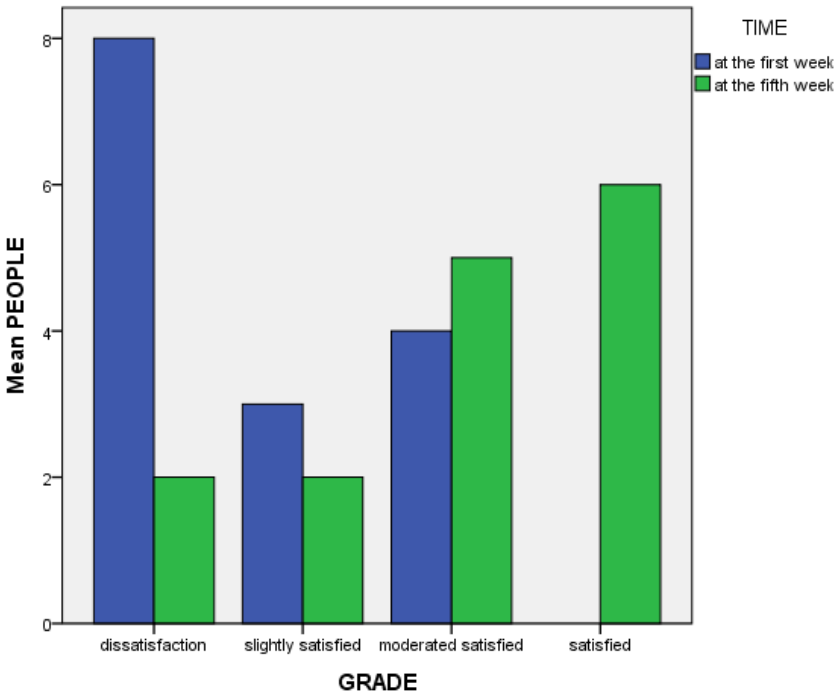

Fig. 4. Overall Satisfaction by Subjects

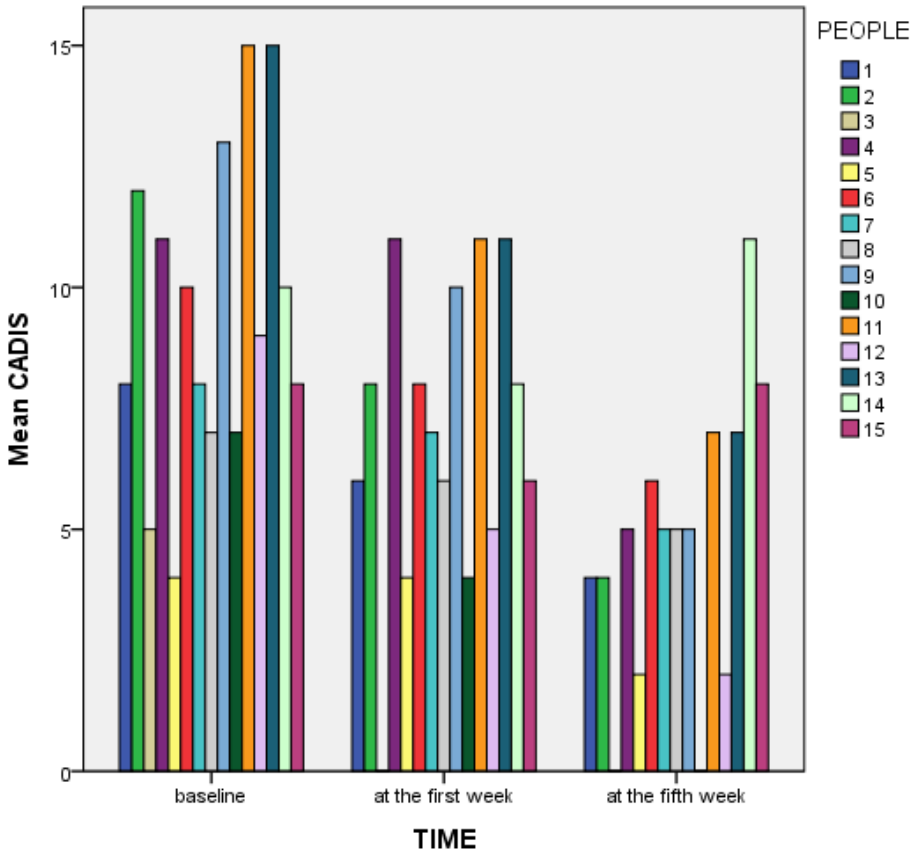

Fig. 5. Cardiff Acne Disability Index- Please indicate how bad you think your session is now

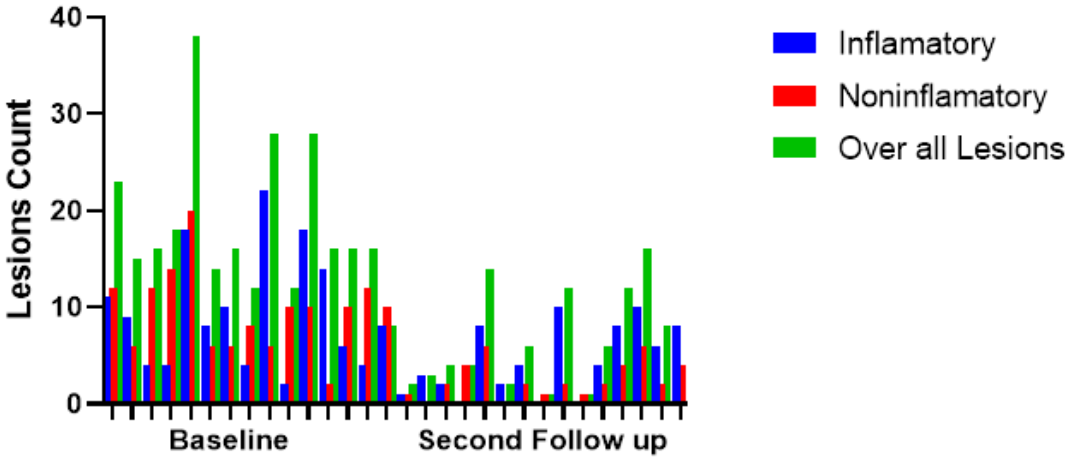

Fig. 6. Lesions Count of 15 patients baseline and second follow up

There were no statistically significant differences in pain levels between sessions, and patients felt that the treatment plan was manageable (VAS of 1.57±0.57). The average amount of time that all participants who underwent treatment had to be by themselves was under a day. The average delay was 3.6 hours as a result of face redness. Two people reported a little itching and a little scorching on their left chin and cheek, but both went away on their own the next day after the treatment. Fig. 6 showing the lesion count that is performed for 15 patients having lesions with different characteristics such as inflammatory, noninflammatory and over all lesions count.

4. DISCUSSIONS:

Dermocosmetic products can reduce the need for topical antibiotics, minimize side effects, and improve the efficacy of acne treatment. But currently there is a shortage of scientific information in Asia about dermocosmetic use and advice for acne vulgaris [17]. The results of a prospective study examining the efficacy and safety of combined 400-600 nm and 800-1200 nm intense pulsed phototherapy in treating face acne vulgaris in Chinese patients were promising. The study used a broad sample of Chinese patients with different skin tones to demonstrate the efficacy of mixed- wavelength regimens in treating both inflammatory and non-inflammatory acne lesions. Positive patient feedback showing the therapy's success in changing their lives serves as strong evidence of its worth. Furthermore, IPL is thought to work by harnessing P. acnes photosensitivity within the pilosebaceous units at lower wavelengths and causing anti-inflammatory effects via controlling cytokine release at longer wavelengths. This study aimed to evaluate the clinical safety and efficacy of a unique dual-band "notch" acne filter (400-600nm and 800-1200nm) for treating both inflammatory and non-inflammatory lesions in people with mild-to-moderate acne. The application of an IPL device with a proprietary "notch" acne filter had a substantial effect on acne vulgaris [18]. The methodology of the study included a thorough selection process, with 15 well- informed participants providing written consent. To establish a homogeneous sample, inclusion and exclusion criteria were used, eliminating persons with specific illnesses or therapies that could potentially interfere with the outcomes. The concentrate on patients aged 15 to 45 with skin types III-IV and mild to severe inflammatory face acne vulgaris narrows the focus even further. The chosen light source, the Lumenis Ltd. M22 system, had a dual-band "notch" filter that emitted non- coherent blue-to-yellow and near-infrared light. Fluences, pulse duration, and interpulse delays were all well-defined and within acceptable safety limits.

The trial design included five full-face IPL treatments spaced out over 1 to 4 weeks, allowing for flexibility based on individual skin conditions and availability. Twenty-one participants with Pillsbury I-III facial acne vulgaris participated in a prospective research trial from July 2017 to January 2018. Each patient had five IPL sessions, spaced outover a four-week period. Four weeks after the last therapy session, the final exam was held. Four weeks following the end of treatment, more than 75% of patients displayed good or satisfactory improvements. For patients in Pillsbury I and II, the overall success rate was 88.24%. There were significantly less inflammatory lesions (14.01, 1.99 vs. 25.23, 2.76) (P =.031). In a study conducted by Lu et al. (2020) [11], the responsiveness of acne vulgaris to IPL therapy was evaluated. The primary outcome indicated a reduction in the mean proportion of inflammatory acne lesions, while the secondary outcome demonstrated a decrease in the mean percentage of non-inflammatory acne lesions. I2 statistics gauged study variability across 8 randomized controlled trials involving almost 450 participants. Comparing MPRI scores, the IPL group exhibited lower performance [mean deviation (MD) = 4.37 (95% CI: 7.83, 0.91), P = .01]. IPL did not significantly improve NMPRI results when compared to other treatment alternatives. Skin reddening (46.73%) and pain (39.13%) were the most typical negative effects.

Intense Pulsed Light (IPL) is unsuccessful and should not be used in place of Photodynamic Therapy (PDT), which is helpful for inflammatory acne lesions. Depending on the area, IPL performance may change. The efficacy and safety of IPL therapy as a standalone treatment for grades 3 and 4 acne in women of reproductive age. The study enrolled 100 female participants with third and fourth-grade acne, who received weekly IPL sessions over six weeks, using a 530nm to 1,200nm filter. The findings suggest that IPL therapy, when utilized alone with a 530–1,200 nm filter, is a safe and effective treatment option for women of reproductive age with inflammatory grades 3–4 acne vulgaris [13]. IPL treatments spaced two weeks apart, followed by four months of observation. The right side received 20J/cm2, while the left side received 10J/cm2. Lesion count reduction was categorized as mild (0 to 25 percent), moderate (26 percent), good (75 percent), or outstanding (100 percent) based on severity. The Mann-Whitney U test was employed for statistical

analysis, revealing favorable outcomes for 49% of patients on the right side—excellent for 29% and remarkable for 22%. On the left side, 43%, 42%, and 15% of patients achieved above-average to exceptional results [14]. A study found that benzoyl peroxide (BP) exhibited superiority over IPL when the two therapies were compared, with statistically significant differences emerging midway through the research.

However, by the end of the study, the disparity had largely diminished. The severity of acne saw a substantial reduction after a 5-week course of benzoyl peroxide and intense pulsed light (IPL) [15]. Fifteen women, aged 20 to 28, completed the 5-week therapy phase. Both treatments resulted in an almost 30% overall reduction in comedones and inflammatory lesions ($p=0.0024$). No significant difference was observed between the two regimens in terms of reducing the percentage of comedones and inflammatory lesions from baseline to the fifth week ($p=0.76$ and $p=0.61$, respectively). According to the AGSS ($p=0.26$), there was no statistically significant change in acne lesion severity between the two treatments over the 5-week period [16].

The Global Aesthetic Improvement Scale (GAIS) and Cardiff Acne Disability Index (CADI) assessments comprehensively captured the treatment impact. The average GAIS score of 3.07 revealed a statistically significant reduction in overall lesion occurrence. Patient-reported CADI scores indicated continuous improvement at 1-week and 4-week follow-ups, with 86.67% reporting enhanced skin conditions, and 80% expressing satisfaction with therapy outcomes. These findings underscore the positive impact on patients' quality of life, affirming the efficacy of combined IPL therapy for personalized acne treatment.

The final clinical evaluation, conducted two weeks after the sixth treatment, demonstrated significant decreases in the melanin index, mean papules, pustules, and comedones. Noteworthy, IPL treatment with a dual-band filter presents a viable option for those unable to take systemic acne medication, and it can be complemented with traditional acne treatments for enhanced results. Based on current data, IPL emerges as a safe and effective treatment for rosacea and acne vulgaris, earning a B recommendation. Grades C and D suggest IPL as a temporary or supplementary treatment for various inflammatory skin conditions, with common side effects being temporary erythema, edema, and soreness. In some cases, hyperpigmentation, blisters, and a burning sensation may occur. While the study provides valuable insights into the effectiveness of combined IPL therapy for facial acne vulgaris in Chinese patients, further research is needed to explore long-term consequences and optimal therapy settings.

5. CONCLUSIONS:

In conclusion, the prospective study on the effectiveness and safety of combined 400–600 nm & 800- 1200 nm strong pulsed phototherapy in treating facial acne vulgaris in Chinese patients is highly positive. In a variety of Chinese patients with various skin tones, mixed wavelength regimens appear to be effective in treating both inflammatory & non-inflammatory acne lesions. Patient reviews applauding the therapy's success in enhancing its recipients' lives serve as evidence of its worth. The low frequency of short-term side effects further corroborates the safety of this therapeutic strategy. While this study is a positive step toward satisfying the needs of the Chinese people, more analysis is required to better define the treatment settings and pinpoint the full effects of combined IPL therapy. This study emphasizes the significance of tailoring therapies to match the particular needs of different ethnic groups and adds to the expanding body of data demonstrating the efficacy of tailored acne treatment strategies. These kinds of studies are essential for developing the field of dermatological care and improving the lives of people with face acne vulgaris.

Conflict of Interest. None Declared

Funding. Self funded by authors

Ethical clearance. All procedures performed in our research involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Further research study was approved by Ethical and research committee of Guangzhou Medical University, Guangzhou, Guandong province, China.

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