

## THE EFFICACY OF LINEAR POLYCHROMATIC NON-COHERENT LIGHT (BIOPTRON LIGHT) IN THE TREATMENT OF PLAQUE PSORIASIS

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### ABSTRACT

**Objective:** The purpose of study was to evaluate the efficacy of linear polychromatic non-coherent light (bioptron light) in the treatment of plaque psoriasis. **Subjects:** Thirty patients with plaque psoriasis assigned randomly into 2 groups; Experimental group that received Bioptron light therapy in addition to topical methylprednisolone aceponate 0.1% cream while Control group received the topical cream only. Severity of disease and thickness of skin were measured pre and post treatment by PASI score and ultrasonography respectively. **Results:** the results of study showed that there were significant differences after intervention between both groups as regard to PASI and thickness of skin as p value <0.05. **Conclusion:** Our study support

that BLT has a potential benefit in the management psoriasis, the PASI & thickness of skin were decreased significantly after 4 weeks of combined treatment of BLT & topical steroid more than only topical steroid.

**KEYWORDS:** BIOPTRON Light, Plaque Psoriasis, PASI, thickness of skin.

### INTRODUCTION

Psoriasis is T-cell mediated autoimmune inflammatory skin disease characterized by skin surface inflammation, epidermal proliferation, hyperkeratosis, angiogenesis, and abnormal keratinization. It is a chronic, relapsing and remitting inflammatory skin and joint disease that has a prevalence of 2–3% worldwide. The course of psoriasis is variable and often unpredictable and is characterized by periods of spontaneous remission and relapse.<sup>[1,2]</sup>

Psoriasis has a significant negative impact on patients' health related quality of life (HRQoL). In a survey by the National Psoriasis Foundation almost 75% of patients believed that psoriasis had moderate to large negative impact on their quality of life (QoL), with alterations in their daily activities.<sup>[3]</sup> Another study reported that at least 20% of psoriasis patients had contemplated suicide.<sup>[4]</sup> Patients with psoriasis have a higher financial burden due to absenteeism in addition to the cost of caring for their disease.<sup>[5,6]</sup> Recent studies showed that psoriasis is an important risk factor in many diseases. Lately, it was found that psoriasis is an independent risk factor for diabetes (type 2 DM) and cardiovascular diseases, including hypertension, and hypercholesterolemia. Moreover, other comorbidities commonly associated with psoriasis are arthritis, depression, insomnia and obstructive pulmonary disease.<sup>[7,8]</sup>

Although topical treatments are sufficient for many patients, some need additional systemic drugs. These drugs have a potential for serious side effects, such as hepatotoxicity and nephrotoxicity (methotrexate, cyclosporine) teratogenicity (oral retinoids), and skin cancer (photo/chemotherapy), which limits their long-term use.<sup>[9]</sup>

The Bioptron Light Therapy (BLT) is a worldwide patented light therapy medical device with a emitting light that is similar to the part of the electromagnetic waves produced naturally by the sun but with no harmful UV radiation. BLT devices emit light containing a range of wavelengths that correspond to visible light plus infrared radiation, both of which have been reported to stimulate the biological reactions.<sup>[10,11]</sup>

BIOPTRON Light Therapy can help to promote skin healing and reduce the discomfort associated with various skin disorders. BLT has so-called biostimulative effects. When applied to the skin, it stimulates light-sensitive intracellular structures and biomolecules. This initiates cellular chain reactions and triggers so-called secondary responses, which are not only limited to the treated skin area but can involve the whole body.<sup>[12,13]</sup> There has been little reports about clinical effect of linear polychromatic non-coherent light (bioptron light) on psoriatic conditions. The aim of this study was to evaluate the efficacy of linear polychromatic non-coherent light (bioptron light) in the treatment of plaque psoriasis.

## METHODS

### Participants

Thirty participants ( 12 male & 18 female ) with plaque type psoriasis were included in this study. They admitted to the phototherapy unit at Dermatology Outpatient clinic of El-Mataria

Teaching hospital over a period of 12 months from July 1, 2012 to June 30, 2013. Diagnosis was made on clinical basis by a physician and confirmed by measurement Psoriasis Area Severity Index (PASI) and thickness of plaques. Patients with the following criteria had been enrolled in the study; patients with ages ranged from 20 to 60 years, subjects had moderate & severe degree of psoriasis and patients with skin types III and IV, patient should be willing to participate in the study and comply with the follow-up. The hospital ethics committees approved the study, and all patients gave their written consent before enter the study. Before randomizing, subjects were excluded if: they had other types of psoriasis, photosensitive patient.

The patients who met inclusion criteria were randomly divided into the experimental (E) and the control group (C). The random divide was performed by the random numbers table.<sup>[14]</sup> The patients in the experimental group were treated using Bioptron light therapy in addition to topical methylprednisolone aceponate 0.1% cream while Control group received only topical methylprednisolone aceponate 0.1% cream twice per week for 4 weeks.

### **Procedures of the study**

A verbal explanation about the importance of the study and main points of achievement were explained to every patient. The procedures of the study were divided into two main categories.

## **1. Measurement procedures**

### **1.1.Primary outcomes**

*Measurement of severity of disease by Psoriasis Area severity index.*<sup>[15,16]</sup>

The Psoriasis Area severity index (PASI) is used to give a general impression of psoriasis severity. The body is divided into four regions; the head and neck (H), the trunk (T), the upper extremities (U), and the lower extremities (L). The grade of erythema (E), infiltration (I), and desquamation (D), were used for symptom score calculation. Erythema, infiltration and desquamation are measured on a scale of zero (none), one (slight), two (moderate), three (severe), and four (very severe). The percentage of each area (A) involved is given a number from zero (0% involved) to six (100% involved). The PASI formula then is  $0,1 (EH + IH+DH) AH+ 0.3 (ET + IT+DT) AT +0.2 (EU+ Iu +Du) Au + 0.4 (EL + IL+DL) AL$ . In chronic plaque psoriasis, a PASI under eight is designated as mild, between 8 and 12 is moderate, and over 12 is severe. In clinical trials involving the evaluation of treatment

modalities, efficacy is often expressed as percentages of patients reaching PASI reductions of 90%, 75%, and 50%.

## 1.2 Secondary outcomes

### *Measurement of skin thickness by ultrasonography*

20 MHz Ultrasonography was used to evaluate the thickness of skin, Measurement were performed before the treatment and after 4 weeks for both groups. Measurements were performed under standardized conditions such as; Measurements were carried out by the same investigator, All values were given as the median of three recordings to avoid measuring inaccuracies, The same area was measured before and after therapy for each patient by determining it in relation to any landmark, The patients were given 10 min. to adapt to room conditions and this constant for all patients, Measurements were always carried out with the patient in a resting position. The thickness of the ultrasound coupling gel layer was adjusted to about 1mm to ensure standardization. The area to be investigated uncovered and the gel was applied over it. The transducer was placed on the area to be measured. The scan obtained was transferred to the monitor screen where it was reading by the investigator. The instrument then printed a copy of the scan for documentation and referral purposes.

## 2. Treatment procedures

Bioptron Light Therapy was applied for experimental group. Bioptron Compact III light therapy system (PAG-860) was developed and produced by Bioptron AG, Switzerland Fig(1). It is Innovative new technology with clinically proved efficacy and visible results encourage patient compliance. It is mobile, easily manageable and maintenance-free device.<sup>[17]</sup> The following are the technical characteristics and specifications of the BLT; Filter diameter approx. 4 cm, Power supply: 100-230 V, Power consumption: 56 VA, Wavelength: 480-3400 nm, Degree of polarization: > 95% (590-1550 nm) , Specific power density: av. 40 mW/ cm<sup>2</sup>, Light energy per minute: av. 2.4 Joule/ cm<sup>2</sup> .

Polarized light therapy was performed for six min daily, five times a week for 4 weeks. Every patient was positioned comfortably and Bioptron lamp was applied perpendicularly to the treated area at a distance of 10 cm.

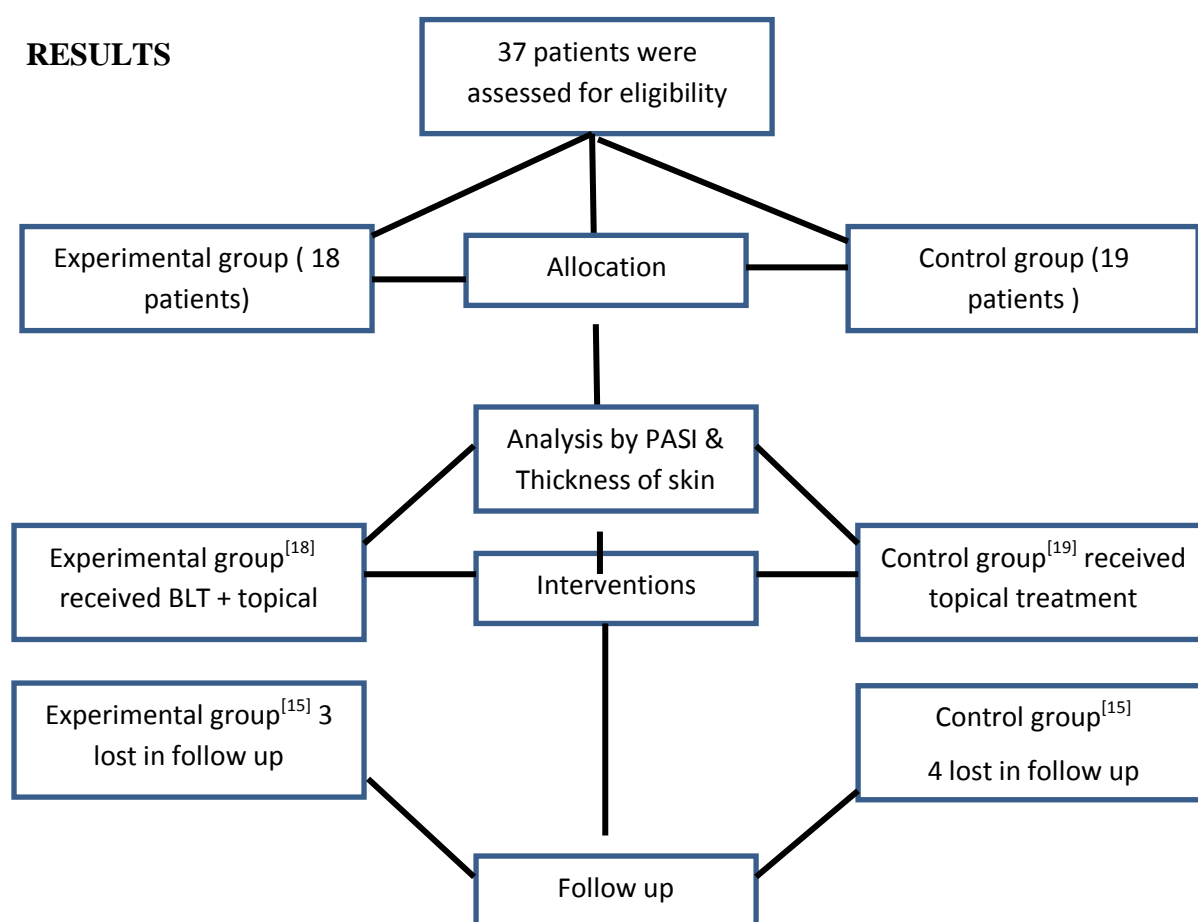


**Fig(1) Bioptron Lamp**

### Statistical Analysis

Continuous variables were presented as mean and standard deviation while categorical variables were described by frequency and percentage. Because most of the measured data were not normally distributed, nonparametric tests had been used for analyses. The Wilcoxon test was used to test the differences in outcome measures within group. The Mann–Whitney U test was used for comparison between the groups. Significant differences were assumed at  $p < 0.05$ . Statistical analyses were performed using Statistical Package for the Social Sciences (SPSS) version 21.0

### RESULTS



**Fig. 2: shows the flow chart of patient s through the study**

**Fig. 2** shows the flow chart of patient enrollment through the study. Among the total of 37, patients who met the inclusion/exclusion criteria, seven patients (three in the experimental group and four in the control- group) did not complete their treatment. Therefore, 30 patients (15 patients in the experimental group, and 15 patients in the control-group) completed the study procedures and were included in the final analysis.

**Table 1** represents the demographic and clinical characteristics of patients. Both groups were comparable in respect to age (  $p = 0.466$ ), duration of psoriasis (  $p = 0.560$ ), and sex (  $p = 0.464$ ), skin type (  $p = 0.717$ ). There were no significant differences as regard to age, sex, skin type. PASI & thickness of skin were measured for both groups before the treatment. There were no significant differences between both groups as regard to PASI & thickness of skin as  $p$  value = 0.677, 0.967 respectively.

**Table 1: The demographic and baseline clinical characteristics of patients.**

Variable	Experimental N(15)	Control N(15)	P value
Age (years)	43.80± 10.63	40.80± 9.29	0.466*
Duration (month)	10.33±7.19	11.87±7.45	0.560*
Sex N(%)			
Male	(10)66.7%	(8)53.3%	0.464*
Female	(5) 33.3%	(7) 46.7%	
Skin type N(%)			
Type III	(6)40.0%	(7) 46.7%	0.717*
Type IV	(9)60.0%	(8)53.3%	
Initial PASI	14.53±4.34	15.53±5.30	0.677*
Initial thickness of skin (cm)	0.2313±0.045	0.2113±0.054	0.371*

\* No significant difference

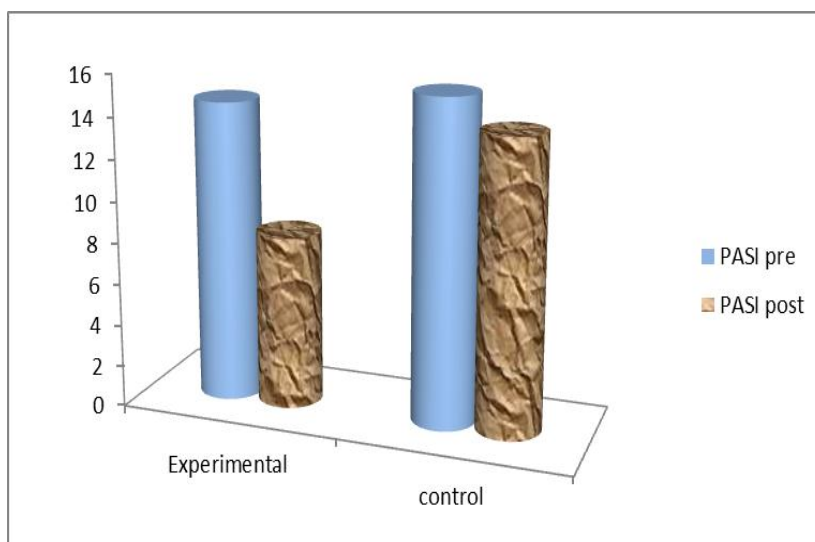
**Table 2:** showed significant differences between experimental and control group as regard to PASI and thickness of skin as  $p$  value = 0.001, 0.000 respectively. The percentage of improvement were 43%, 47% in experimental group as regard to PASI and thickness of skin respectively while in control group the percentage of improvement were 9%, 3% . fig (3), (4).

**Table 2: Statistical analysis of PASI & thickness of skin within and between experimental and control group**

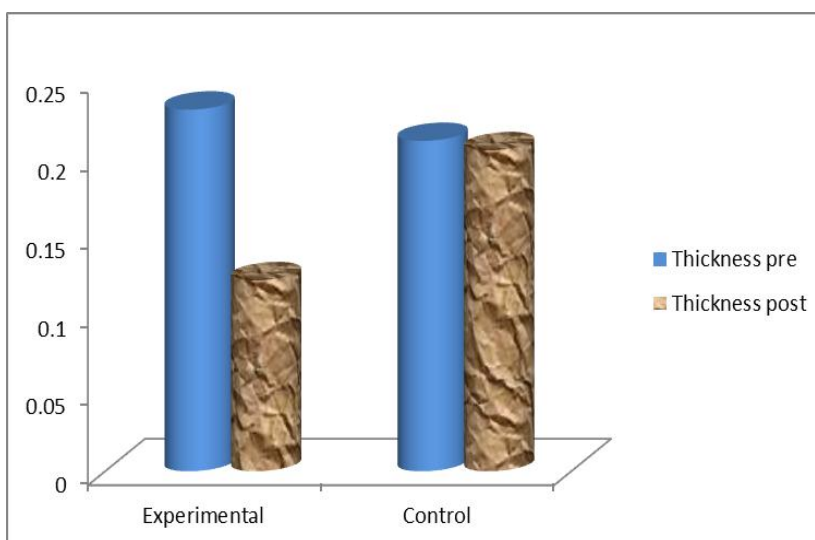
Variable	Experimental N(15)	Control N(15)	P value Between groups
PASI pre	14.53±4.34	15.53±5.30	0.677*
PASI post	8.33±2.9	14.00±4.44	0.001**
P value within group	0.001**	0.003**	
% of improvement	43%	9%	
Thickness of skin pre (cm)	0.231±0.045	0.211±0.054	0.371*
Thickness of skin post(cm)	0.122±0.028	0.205±0.051	0.000**
P value within group	0.001**	0.013**	
% of improvement	47%	3%	

\* No significant difference

\*\* Significant Differences



**Fig(3) Statistical analysis of PASI between experimental and control group**



**Fig (4) Statistical analysis of thickness of skin between experimental and control group**

## DISCUSSION

Light has been used as a healing tool since ancient times. Scientists now have a better understanding of which components of natural light are useful in the stimulation of healing. This has led to the development of optical devices to produce various types of 'medically useful' light, such as the Bioptron Light Therapy (BLT) System.

The purpose of this study was to investigate the efficacy of Bioptron Light Therapy as a new trend for the treatment of psoriasis. Patients classified randomly into two groups; Experimental group received Bioptron Light Therapy in addition to topical steroid while control group received only topical steroid. Measurement the efficacy of treatment was done through calculation of PASI and measurement the thickness of skin by ultrasonography pre and after 4 weeks of treatment for both groups.

The results of this study demonstrated a significant effect of Bioptron Light Therapy. There were noticeable reduction in PASI & skin thickness after 4 weeks of treatment for Experimental (BLT) group more than Control group. The percentage of improvement as regard to PASI & skin thickness was 43% & 47% respectively for Experimental group while the percentage of improvement for control group as regard to PASI & skin thickness was 9% & 3% respectively.

To our knowledge, this is a first randomized clinical trial studied the effect of Bioptron Light Therapy (BLT) in the treatment of psoriasis. The mechanism to explain the effect of BLT on psoriasis is still not clear. However. The mechanism explanation may be increase the anti-inflammatory effect and decrease elevated pro inflammatory cytokine such as TNF- $\alpha$ , IFN- $\gamma$ , and IL-2. It stimulates and modulates reparative and regenerative processes as well as the processes of the human defense-system as it acts in a natural way by supporting the regenerative capacity of the body and therefore helps the body to release its own healing potential.<sup>[18-20]</sup>

Moreover some studies reported that the mechanism of BLT may explained in terms of photobiomodulation.<sup>[22,23]</sup> Biomodulation is the process of changing the natural biochemical response of a cell or tissue within the normal range of its function to stimulate the cell's innate metabolic capacity to respond to a stimulus.<sup>[21]</sup> Recent studies showed that photobiomodulation could regulate the inflammatory responses and promote spontaneous healing, too.<sup>[18,24]</sup>

In a study<sup>[25]</sup> of using low level polarized polychromatic noncoherent light LPPT in the treatment of acrodermatitis continua, 4 times clinical exposure of LPPL with topical steroid application showed clinical improvement and the effect was maintained for several months without needing further topical steroid application. Also the clinical improvement was maintained even after replacing topical steroid with topical moisturizer. In addition there was no recurrence or aggravation of skin lesion. It was concluded in this study that LPPL could work successfully on the inflammatory skin disease without any side-effect.

Furthermore Bioptron Light Therapy may help to other treat skin conditions such as atopic dermatitis by relieving pain and inflammation, by promoting a healing response in any skin lesions.<sup>[26]</sup>

As regard to side effects, results of study reported no side effects results from application of BLT and this finding is supported by Aleksandar et al;<sup>[27]</sup> findings as they reported in their study conclusion that polarized light is useful in the treatment of pressure ulcers and There is no description of the potential treatment complications after polarized light therapy.

Limitation of this study was small sample size, no follow up. Further studies are required to include large sample size and follow up in order to generalize the effect of Bioptron in treating psoriasis. Further studies are required also to investigate the effect of this modality for other types of psoriasis.

On conclusion; our study support that BLT has a potential benefit in the management psoriasis, the PASI & thickness of skin were decreased significantly after 4 weeks of combined treatment of BLT & topical steroid more than topical steroid only.

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