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Pulsed Dye Laser versus Polarized Light Therapy in Treatment of Psoriasis

Zeinab A. Ali

Department of Physical Therapy, Department for Surgery,
Faculty of Physical Therapy, Cairo University, Giza, Egypt

Abstract: The purpose of The current study was to compare between the effect of pulsed dye laser therapy [PDL] and polarized light therapy [PLT] in the Treatment of psoriasis. Fortyfive patients were included in this study. Their ages ranged from 20 to 50 years. Group [A] received 8weeks of treatment with pulsed dye laser therapy [PDL] in addition to their routine medications. Group [B] received polarized light therapy [PLT] with a specific energy density of 40 mW cm. The light is brought and applied to the required area at constant intensity and very low energy but it is constant at 2.4 joule cm^2 per min for 8 weeks, 3 days/week, in addition to their routine medications. Group [C] received 8 weeks of treatment with medications only. The measurements were done before the study and after two months of treatment for all groups by using Ulrasonography. Statistical analysis of this study showed reduction in the thickness of skin after the treatment for Group [A], [B] and [c] with a percentage of 50%, 25.92% and 14.28% respectively for the thickness of skin. There was a highly significant difference between groups after the treatment. It was observed that PDL was more effective than PLT. It could be concluded that. Pulsed dye laser [PDL] is more effective than Polarized light therapy [PLT] in treatment of psoriasis.

Key words: Polarized Light Therapy · Psoriasis · Pulsed Dye Laser

INTRODUCTION

Psoriasis is a chronic disease affecting mainly the skin via immuno-hereditary complexed pathogenesis as the exact aetiology is still unknown. It affects 1 to 3 percent of the population and can occur equally in men and women. Indeed, psoriasis has a complex genetic predisposition, but its development and /or exacerbation appear to involve an interaction between multiple environmental and genetic risk factors [1].

Psoriasis also greatly affect life quality of the affected personnel as it causes considerable psychological and social troubles to the patients. Although psoriasis is no longer considered a fatal disease, however it is well recognized that the suffering patients may have a wide variety of psychosocial diseases such as anxiety, depression and worry [2].

Psoriasis generally responds favorably to treatment, although there is no permanent cure. Numerous modalities of therapy both topical and systemic that act by decreasing the turnover rate of epidermal cells have been used to treat the condition. Treatment usually starts with topical measures such as local corticosteroids, calcipotriol, dithranol or tar. In severe cases where topical treatment has failed, systemic therapy is used such as methotrexate and cyclosporine. Also phototherapy is used such as Ultraviolet B [UVB], photochemotherapy [PUVA], psoralen–UVB, pulsed dye Laser, Combinations of different therapeutics modalities may be used [3].

Traditional modalities of psoriasis therapy acts mainly via inhibition of the process of inflammation and proliferation in the epidermis. As the early noted changes in a new lesion of psoriasis was found in the capillaries. So, Selective vessels destruction of the capillaries that found specifically in the papillary dermis through using selective photothermolysis eradicates the the inflammatory mediators that were extravasated from blood vessels to the interstitium causing clearance of the psoriatic plaques. Moreover, skin blood vessels selective photothermolysis can be done with the flashlamp-pumped pulsed dye laser (PDL) [4].

The PDL has been used in the treatment of psoriasis, primarily because of the highly vascular nature of psoriatic lesions. Waves from the PDL are well absorbed

Corresponding Author: Zeinab A. Ali, Department of Physical Therapy, Department for Surgery,
Faculty of Physical Therapy, Cairo University, Giza, Egypt.

by oxyhemoglobin, a conduit for microvessel damage and destruction. Apart from the blood vessels destruction, therapy using PDL has been found to decrease both number of dermal T helper cells and epidermal T cytotoxic cells [5].

Additionally, polarized light liberated from low power both laser and non-laser devices has been applied as a non-invasive modality in the management of different musculoskeletal diseases, wound healing acceleration and skin ulcers treatment. Although the multiple photo-biostimulatory effects of polarized light such as cell proliferation, collagen synthesis enhancement, circulatory system changes and anti-inflammatory effects, its exact mechanism of action is still uncertain. The available non-laser optical devices are the Bioptron products which emit a wide beam of polarized, non-coherent, polychromatic, low energy light that compromise visible spectrum wavelength [480-700nm] and infrared radiation (700-3400nm); this wide range enables maximum tissue penetration and stimulation without carrying the DNA damage risk [6].

Biomodulation is the changing method of natural biochemical tissue or cell response within its function normal range to activate the innate metabolic ability of the cell as regards its response to stimulus. When biomodulation takes place from a photon conveying its energy to a low polychromatic polarized light [LPPL] was established to have anti-inflammatory role on gingivitis and chronic tendonitis in numerous reports. Others demonstrated that the exposure of a small area of the human body to LPPL (480-3,400 nm, 12 J/cm^2) decreased in the elevated pro-inflammatory cytokine levels and increased in the anti-inflammatory factor concentration**.** The reduction of pro-inflammatory mediator's cytokine like IFN-γ, TNF-α and IL-2 has anti-inflammatory role after exposure to LPPL may carry a suitable clarification of the observed clinical outcome of LPPL in skin diseases with inflammatory nature [7]. Consequently, the present study aim was the comparison between the efficacy of pulsed dye laser therapy [PDL] and polarized light therapy [PLT] in psoriasis treatment course.

MATERIALS AND METHODS

Study Design: The present study design was a randomized, prospective, controlled double-blind trial. Ethical approval was attained from the ethics committee of scientific research of Physical Therapy Faculty belonging to Cairo University.

Participants: A convenient sample of forty-five (28 males and 17 females) was enrolled from outpatient clinic of Dermatology Department in EL-Matria Teaching Hospital. Assessment for their participation eligibility was done prior to their enrollment in the study respecting the following specific inclusion criteria:

- The range of their ages were from 35 to 50 Years.
- Subjects had mild to moderate degree of psoriasis (Localized psoriasis).
- Subjects had plaque-type of psoriasis.

The participants were excluded if they had skin malignancy in the area to be treated, Anemia, history of diabetes, circulatory or sensory disorders, pregnant women and patients with acute infection in the area to be treated.

Informed written consent was signed from each parent after explaining the nature, purpose and benefits of the study.

Randomization: Forty-five patients who had psoriasis in the chronic stage in the arm and leg participated in this study. Randomization was applied using random number tables with the codes of treatment were kept in closed envelopes throughout the study. Participants were randomized into three equal groups; *Group A* (*Pulsed dye laser group*) included fifteen patients received PDL (3-5 sessions with an average of 4 sessions for each patient with two weeks apart). plus the routine medical treatment, *Group B* (*polarized light therapy group*) included fifteen patients received polarized light therapy (3 sessions per week for two months] in addition to the routine medical treatment) and *Group C* (*control Group*) included fifteen patients received 8 weeks of treatment with the routine medical treatment only.

Outcome Measure

Ultrasonography Measurements: Ultrasound imaging system was used to measure the thickness of the skin at the site of scale for three groups. The instrument combines a scanning transducer and a computer in a single insturment that used at a patient' bed side producing high- resolution images of human tissue.

Intervention

For Group a (Pulsed Dye Laser Group): Information about the measurement and treatment procedures of the PDL device were given for every patient. Explanation about the risks of looking to the device rays and wearing special safety glasses during the treatment performance

was done with every patient. Patients selection criteria was with lesions mostly of chronic plaques type, stable for at least 2 months, the selected lesions were all in the covered areas to be protected from heat or sunlight exposure. They were of variable size at least 12cm^2. Patients were given all needed information about the procedure and its expected advantages and disadvantages before first session.

For Group B (Polarized Light Therapy Group):

- Patient was informed about measurement and treatment procedure, before beginning the treatment.
- The patient position was ensured to be suitable and comfortable position.
- Device preparation:
- The plug of the Bioptron Light Therapy [BLT] unit was transferred to the main current, then the on /off switch button was switched on.
- Then the treatment parameters were set of BLT.
- BLT application:
- Point the light beam at the area to be treated holding the device at right angle [90^o] perpendicular to the surface of the psoriasis and maintaining a distance of 10 cm from the surface of the psoriasis and maintaining a distance of 10 cm from the surface of the psoriasis and applying the BLT for about 10 minutes.
- Frequency of application:
  Applied 3 sessions per-week for 2 months [8].

Group C (Control Group): This group received 8 weeks of treatment with the routine medical treatment and topical corticosteroids at the site o lesion.

Statistical Analysis: Descriptive statistics and ANOVA-test were conducted for comparison of the subject characteristics between the three groups. Chi- squared test was applied to compare sex distribution throughout groups. Shapiro-Wilk test was used to check data normal distribution. Levene's test for homogeneity of variances was conducted to ensure the homogeneity among groups. ANOVA was performed to compare skin thickness between groups. Post-hoc test was conducted using the tukey test. The level of significance for all statistical tests was set at $p < 0.05$. Total statistical analysis was performed according to the statistical package for social studies [SPSS] version 22 for windows [IBM SPSS, Chicago, IL, USA].

RESULTS

Participant Characteristics: Table 1 showed the participant characteristics of group A, B and C. There was no any significant difference in the mean age throughout all the three involved groups [$p > 0.05$]. Also, there wasn't found any significant statistical difference in distribution of sex throughout groups [$p > 0.05$].

Effect of Treatment on *Skin Thickness*

Between Group Comparison: There wasn't found any significant statistical difference throughout all the three involved groups in the thickness of the skin before treatment ($p > 0.05$).

Post treatment there was a significant decrease in skin thickness of the group A compared with that of groups B and C [$p < 0.05$]. Moreover, there was found a significant decrease in the thickness of the skin of the group B when compared with the other group C ($p < 0.05$).

Within Group Comparison: There was found a significant statistical decrease in the thickness of the skin in group A, B and C after treatment if compared to that before treatment [$p < 0.05$]. The percent of decrease in skin thickness in the group A, B and C was 50, 25.92 and 14.28% respectively (Table 2).

DISCUSSION

Psoriasis is one of the most commonly occurring skin disorders among UK people. It is considered a chronic, non-contagious, inflammatory skin disease that has a nature of a relapsing and remitting course. It affects 1 to

Table 1: Characteristics of participant.

		Group A	Group B	Group C	
		mean±SD	mean±SD	mean±SD	p-value
Age [years]		40.93±4.13	41.4±2.94	41.86±4.12	0.79
Sex	Males	9 [60%]	10 [67%]	8 [53%]	0.75
	Females	6 [40%]	5 [33%]	7 [47%]	

SD, Standard deviation; p-value, Level of significance

Table 2: *Mean values of skin thickness pre and post treatment of group A, B and C:*

	Group A	Group B	Group C	p-value		
	mean±SD	mean±SD	mean±SD	A vs B	A vs C	B vs C
Skin thickness [cm]						
Pre treatment	0.28±0.04	0.27±0.03	0.28±0.05	0.87	0.92	0.9
Post treatment	0.14±0.04	0.2±0.03	0.24±0.04	0.001*	0.001*	0.009*
MD	0.14	0.07	0.04			
Percentage of change	50	25.92	14.28			
	*p = 0.001**	*p = 0.001**	*p = 0.001**			

SD, Standard deviation; MD, mean difference; p-value, Level of significance; *, Significant

3 pcrcent of the population and can occur equally in men and women. It is characterized by hyperproliferation of the epidermis resulting in well-demarcated, indurated, erythematous, silvery, dry, scaled plaques and can develop in any site on the entire skin of the body. Common sites involve the knees, elbows, lower back and scalp [9].

Furthermore, Psoriasis has a significant effect on patients' life quality. Several researches have demonstrated the stress, anguish and massive disruption that psoriatic people suffered in their life, relationships they can form with others and even their themselves perception [10].

So this controlled randomized study was conducted to compare between the efficacy of polarized light therapy and betamethasone phonophoresis in the treatment of psoriasis.

The parameters investigated in this study were measurement of thickness of skin by ultrasonography before [pre] and after one month of application of treatment [post], were performed to compare the effect of pulsed dye laser versus polarized light therapy in psoriasis treatment.

In relation to thickness of skin, the results of this study revealed that there were significant decrease in Thickness of skin [all group]

There was found a significant decrease in mean values of the thickness of the skin after treatment in group A, B and C when compared with pretreatment values [p = 0.0001]. The percent of change in group A, B and C were 50%, 25.92% and 14.28% respectively.

Results of this study concerning the effect pulsed dye laser in the Treatment of psoriasis confirm the observations of:

Noborio *et al.* [11] revealed that PDL therapy enhances psoriasis. Since, treatment by PDL decreased the total number of microvessels in papillary dermis which are chief pathogenetic targets in the pathogenesis psoriasis and because PDL therapy is selectively targeting the superficial vessels, it is therefore considered an effective therapeutic approach.

Bovenschen *et al.* [12] pointed out that PDL treatment for localized and recalcitrant plaque psoriasis resulted in persistent reductions of activated and memory effector dermal T-helper cells, epidermal cytotoxic T cells and the return of epidermal keratinization and proliferation to normal as compared with therapy with topical ointment containing calcipotriol/betamethasone dipropionate.

Erceg, *et al*. [13] determined that treatment with PDL should be applied for the management of recalcitrant, small, localized plaque psoriasis after failure of other topical medications.

Hern *et al.* [14] revealed that PDL can perform selective thermolysis of psoriatic plaque capillaries biweekly for three treatments result in significant clinical improvement in the psoriatic plaque**.**

Taibjee, *et al.* [*15*] shown that PDL therapy are beneficial treatments for the psoriatic plaques and remission for long period could be is achieved with laser.

The results of this study that polarized light therapy has a beneficial effect on treatment of plaque psoriasis are consistent or supported by the works reported by:

Pejcic *et al*.[16], A LPPL was proven to have anti-inflammatory effect on chronic tendonitis and gingivitis in several reports. Others demonstrated that the exposure of a small area of the human body to LPPL [480-3,400 nm, 12 J/cm^2] decreased in the elevated pro-inflammatory cytokine levels and increased in the anti-inflammatory factor concentration. This proinflammatory cytokine reduction such as IFN-γ TNF-α, IL-2 reduction and also the anti-inflammatory effect post exposure to LPPL could pose an appropriate explanation for the LPPL clinical outcome in multiple inflammatory skin conditions.

Pereira *et al*. [17] demonstrated that low level light therapy on different clinical diseases is getting significant attention. Its use was usually limited to some conditions

such as relieving numerous rheumatic condition, wound healing and pain control. The exact mechanism of action is not obvious, although it could be explained with the role of photobiomodulation. The photobiomodulation has been found to normalize the exposed cellular milieu in multiple diseases and stimulate spontaneous healing. Recent researches showed that photobiomodulation has a regulatory effect on the inflammatory responses.

CONCLUSION

From the previous discussion of these results and according to reports of researches in the field related to the present study, it could be concluded that PDL and PLT are safe and effective methods in controlling of psoriasis lesions but PDL is more effective in expression of reducing thickness of skin of psoriatic areas.

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