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Original Research Article

Polarized Light Therapy versus Betamethasone Phonophoresis in Treatment of Psoriasis

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Abstract

Purpose: the current study was to compare between the effect of polarized light therapy (PLT) and betamethasone phonophoresis in the Treatment of psoriasis. ***Subject:*** fifteen patients were included in this study. Their ages ranged from 25 to 60 years. Each patient was divided into two sides ***Procedures:*** Group (I) 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. In addition to topical corticosteroids for 4 weeks, 3 days/week. Group (II) received 4 weeks of treatment with betamethasone diprobionate phonophoresis (BDP) using continuous mode for 5 min, with 1 MHz and 1.5 W/cm^2, 3 days/ week while. Group (I) received 4 weeks of treatment with topical corticosteroids only while. The measurements were done before the study and after one month of treatment for all groups by using Ultrasonography. ***Results:*** of this study showed reduction in the thickness of skin after the treatment for Group (A), (B) and (c) with a percentage of 41.66%, 29.16%, and 8.69% respectively for the thickness of skin. There was a highly significant difference between groups after the treatment. It was observed that PLT was more effective than betamethasone diprobionate phonophoresis. ***Conclusion****:* It could be concluded that. Biptron light therapy (BLT) is more effective than betamethasone phonophoresis in treatment of psoriasis.

Keywords: Betamethasone phonophoresis, psoriasis, polarized light therapy.

INTRODUCTION

Psoriasis is hereditary chronic immune mediated inflammatory skin disorder of unknown aetiology. It affects 1 to3 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 genetic and environmental risk factors [1].

Psoriasis has a significant impact on patient quality of life. The social and psychological impact is considerable. Psoriasis is not considered a life-threatening disease, but it is well established that those patients may experience a range of psychosocial difficulties, including elevated levels of 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), photo chemotherapy (PUVA), psoralen–UVB, Combinations of various therapeutics may be used [3].

Topical corticosteroid is effective in patients with psoriasis. The local and systemic side effects of topical steroids are well recognized. Local effects include skin atrophy, telangiectasias, hypopigmentation, rosacea, perioral dermatitis and acne. Systemic side effects include adrenal suppression, cataracts, glaucoma and growth retardation in children [4].

The risk of side effects from corticosteroids depends on multiple factors, including the potency of the steroid, the vehicle, the amount of steroid used, the concomitant use of occlusion, the area being covered and the integrity of the skin. The greatest penetration occurs with steroid use on the groin and face; the lowest penetration occurs with application on the palms and soles [5].

History of applying light as a therapeutic remedy dates back to ancient Egypt. In dermatologic field, ultraviolet A (UVA: 320-400 nm) and ultraviolet B (UVB: 280-320 nm) has been mainly focused. Many phototherapeutic and photochemical modalities using UVA and UVB have been developed and used effectively in many inflammatory skin diseases such as psoriasis and atopic dermatitis [6].

Bioptron''' polarized light (Bioptron, AG, and Switzerland) is produced on a special multilayered mirror, and its characteristics are as follows:

- Polarization: All emitted waves are oscillating (i.e. moving / spreading across a plane linearly).
- Incoherence: Every light wave is oscillating at its own wavelength and amplitude. Waves are not synchronized either in time or space, meaning that the waves, and thus their intensities, are neither added nor changed.
- polychromacy: The spectrum of polarized light wavelengths range from 480-3.400 nm, which means that it is in the completely visible light spectrum (400780 nm) and a slight part of the infrared radiation (780-1,500 IRA and 1,500-3,400 IR B). Ultraviolet. Chemically active radiation. Is completely eliminated by a special filter [7].
- Bioptron polarized light has 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.

These constant properties of polarized light rays correspond to the device distance from the body treated area of approximately. 10 cm in the case of the Bioptron Compact III device and 10 to 15 cm for Bioptron 2 device. Polarized light rays penetrate the tissue to a depth of 2.5 cm, depending on the exposure time [7].

Phonophoresis is the use of ultrasound to enhance the delivery of topically applied drugs. Effectively, medicines contained within or under the ultrasound gel are pushed by the sound waves of the ultrasound and driven deep below the skin. Phonophoretically administered medications can penetrate the body much deeper than those massaged by hand over the surface of the skin [8].

Phonophoresis is widely used by physiotherapists. Generally, it is said that phonophoresis will result in greater depth of penetration than iontophoresis. US waves have been reported to penetrate up to 4 to 6 cm into the tissues. Both pulsed and continuous US are used in phonophoresis. Numerous drugs have been administered using phonophoresis. The drugs administered include betamethasone dipropionate, chymotrypsin alpha dexamethasone, fluocinonide, hyaluronidase, iodine, ketoprofen, lidocaine, mecholyl, naproxen, piroxicam, sodium salicylate, trypsin, and zinc [9].

The process of transmission of the drug through US is dependent on many factors. For example, the type of drug and molecule size is critical. The drug molecule has to be just the right size to be picked up by the US waves and the right size to pass through the body tissue. As well, the medicinal molecule can't react with the US gel. It must also be able to survive the thermal and vibrational effects of the US [10].

One of the greatest benefits to delivering medications via phonophoresis is that the medication can be delivered locally to a desired area. Oral pain killers and anti-inflammatory drugs are introduced to the entire body in equal amounts. With phonophoresis, the part of the body that receives the medication is the part of the body that needs it[11].

MATERIALS AND METHSOD

Forty fife patients who had psoriasis in the chronic stage in the arm and leg participated in this study.

Group I (polarized light therapy group)

This group included fifteen patients received polarized light therapy (3 sessions per week for one month) in addition to topical corticosteroids.

Group II (betamethasone diprobionate phonophoresis group)

This group included fifteen patients received 0.05% betamethasone dipropionate that transmitted through the ultrasound. The Ultrasound delivered for 5 min with a frequency of 1 MHz, intensity of 1.5w/cm^2, and with continuous mode, 3 sessions per week for one month [12].

Group III (control Group)

This group included fifteen patients received 4 weeks of treatment with topical corticosteroids only. 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).

In the present study, all variables including sex, age. Location of treated area, duration of disease, psychic stress, past and family history, medical treatment program, and all other factors may affecting healing process (e.g. diabetes) were matched in all patients in two groups.

So the findings of this study indicated statistical differences in thickness of the skin between all groups after application of treatment.

Measurement Procedures

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 instrument that used at a patient' bed side producing high- resolution images of human tissue, Treatment Procedures

For Group I (polarized light therapy group PLT)

- Patient was informed about measurement and treatment procedure, before beginning the treatment.
- The patient was placed in suitable comfortable position.

Device preparation

The plug of the Bioptron Light Therapy (BLT) unit was inserted into the main current supply; the on /off switch was switched on.

Then set the treatment parameters 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 1 month

Group II (betamethasone diprobionate phonophoresis group BDP)

- Determine if there is no contraindications were present.
- The patient placed in a comfortable position.
- Clean and hydrate the body part.
- Frequency was adjusted to 1MHz.
- Intensity was adjusted to 1.5 w/cm^2
- Adjust the time of treatment (for contimous group 5 min.)
- Start treatment.
- The treated area in all patients received the same amount Betamethasone Dipropionate 0.05% cream by using a plastic spatula.
- The cream smeared on to the treated area, and then the treatment head of ultrasound was moved.
- Move the sound head at approximately 4 cm/sec, with an overlap-half the width of the sound head
- Clean the head of ultrasonic unit.

STATISTICAL ANALYSIS

Paired t test was conducted to compare mean values of skin thickness between pre and post treatment in each group. One way ANOVA was conducted for comparison between groups in pre and post treatment conditions. All statistical tests were performed through the statistical package for social studies (SPSS) version 19 for windows (IBM SPSS, Chicago, IL, USA).

RESULTS

All the patients involved in the study have been continued the study until the end of it. None refused or withdrawn.

Subject characteristics

Table 1, showed the mean ± SD age of the three groups of the study A, B, and C. There was no significant difference between the three groups in the mean age (p = 0.56).

Table-1: Comparison of mean age between group A, B, and C

	$\bar{x}$ ±SD				
	Group A	**Group B**	**Group C**	**F- value**	**p-value**
Age (years)	39.53 ± 3.09	37.13 ± 10.58	38 ± 5.9	0.42	0.65*
Gender (n)	(9 m, 6 f)	(8 m, 7 f)	(10 m, 5 f)		

$\bar{X}$, Mean; SD, standard deviation; p-value, level of significance; * Non-significant.

Results of skin thickness

Within group comparison

There was a significant decrease in mean values of skin thickness post treatment in group A, B, and C compared with pretreatment (p = 0.0001). The percent of change in group A, B, and C were 41.66%, 29.16%, and 8.69% respectively. (Table 2, figure 1).

Table-2: Comparison between pre and post treatment mean values of skin thickness in group A, B, and C

	Pre treatment	Post treatment			
Skin thickness (cm)	$\bar{x}$ ±SD	$\bar{x}$ ±SD	**MD**	**% of change**	**p-value**
Group A	0.24 ± 0.07	0.14 ± 0.02	0.1	41.66	0.0001**
Group B	0.24 ± 0.05	0.17 ± 0.03	0.07	29.16	0.0001**
Group C	0.23 ± 0.07	0.21 ± 0.07	0.02	8.69	0.0001**

$\overline{X}$, Mean; SD, standard deviation; MD, mean difference; p-value, level of significance; ** Significant

Comparison between groups

There was no significant difference between the three groups in skin thickness pre-treatment (p = 0.8), while there was a significant difference between groups post treatment (p= 0.0001). There was a significant decrease in skin thickness in group A post treatment compared with group B (p = 0.03) and C (P = 0.0001), also there was a significant decrease in skin thickness in group B compared with group C (p = 0.04). (Table 3, figure 1).

Table-3: Comparison of mean values of skin thickness between groups A, B, and C pre and post treatment

	$\bar{x}$ ±SD			
Skin thickness (cm)	**Group A**	**Group B**	**Group C**	**p-value**
Pre treatment	0.24 ± 0.07	0.24 ± 0.05	0.23 ± 0.07	0.8*
Post treatment	0.14 ± 0.02	0.17 ± 0.03	0.21 ± 0.07	0.0001**

$\overline{X}$, Mean; SD, standard deviation; MD, mean difference; p-value, level of significance; * Non significant; ** Significant.

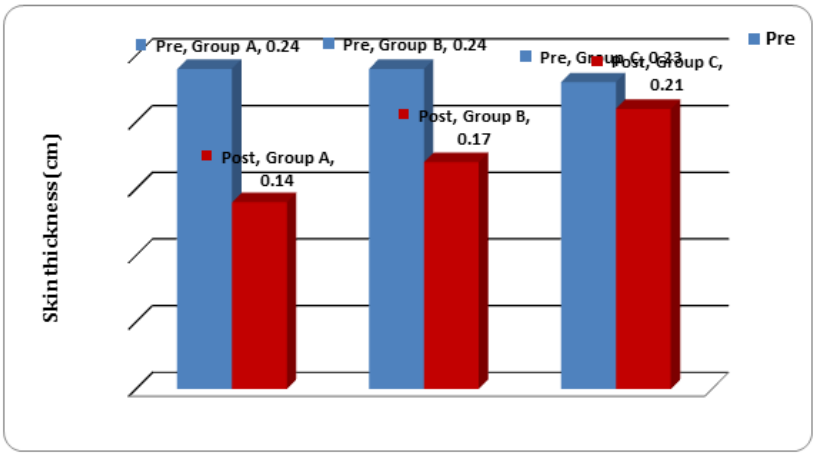

Fig-1: Pre and post treatment mean values of skin thickness of group A, B, and C

DISCUSSION

Psoriasis is one of the most commonly occurring skin diseases in the UK. It is a chronic, relapsing and remitting, inflammatory skin condition, which is non-contagious. It affects 1 to 3pcrcent of the population and can occur equally in men and women. It is characterized by hyper proliferation of the epidermis resulting in well-demarcated, indurated, erythematous, silvery, dry, scaled plaques and can develop anywhere on the body. Common sites are the elbows, knees, scalp and lower back [12].

Psoriasis has a major impact on patients' quality of life. Several studies have documented the anguish, stress and enormous disruption people with psoriasis in their daily lives, relationships with others and their perceptions of themselves [13].

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 used to compare between efficacy of polarized light therapy and betamethasone phonophoresis in the treatment of psoriasis.

In the present study, all variables including sex, age. Location of treated area, duration of disease, psychic stress, past and family history, medical treatment program, and all other factors may affecting healing process (e.g. diabetes) were matched in all patients in two groups.

So the findings of this study indicated statistical differences in thickness of the skin between all groups after application of 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 a significant decrease in mean values of skin thickness post treatment in group A, B, and C compared with pretreatment (p = 0.0001). The percent of change in group A, B, and C were 41.66%, 29.16%, and 8.69% respectively.

Results of this study concerning the comparison between polarized light therapy and betamethasone phonophoresis in the Treatment of psoriasis confirm the observations of:

Escobar-Chavez [14] who suggested that sonophoresis are promising methods of enhancing topical delivery of both dermatologic and non-dermatologic drugs. These methods may enable precise control of transdermal drug delivery rates by varying ultrasound frequency.

Lakshmanan *et al*. [15] pointed that the most likely mechanical explanation of increased drug absorption with US is based on the enhanced intercellular diffusion resulting from the near-simultaneous, high-speed vibration of the drug molecules along with the vibration of the cell membrane and its components.

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. The decrease of proinflammatory cytokine such as TNF-α, IFN-γ, and IL-2 and anti-inflammatory effect after LPPL exposure may pose a suitable explanation of the clinical result of LPPL in the inflammatory skin disease.

Pereira *et al.* [17], Low level light treatment on various clinical conditions is getting considerable attention. Its use was generally limited in wound healing, relieving various rheumatic conditions and pain control before .The mechanisms of action is not clear, although it was explained in terms of photobiomodulation. Bio modulation 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. When bio modulation occurs from a photon transferring its energy to a chromophore, it is referred to as photobiomodulation. The photobiomodulation has been found to normalize the jeopardized cellular milieu in various disease conditions and promote spontaneous healing. Recent studies showed that photobiomodulation could regulate 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 PLT and BDP are safe and effective methods in controlling of psoriasis lesions but PLT is more effective in expression of reducing thickness of skin of psoriatic areas.

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