RESEARCH PAPER

Effectiveness of Polarized Light Therapy on Pimphigus Vulgaris

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ABSTRACT
Pemphigus is a group of relatively chronic autoimmune disorders characterized by formation of intraepithelial bullae in the skin and mucous membrane, The effect of Polarized Light therapy, expressed as pain reduction and the healing of oral cutaneous erosions in PV Objective: The aim of this study was to assess the therapeutic efficacy of Polarized Light therapy on pemphigus vulgaris patients. Patients and Methods: Twenty patients diagnosed as had pemphigus vulgaris were selected randomly from kasr al ainy hospital., Cairo University. They were assigned into two equal groups Group (A): Group (A): The study group included eleven patients that had pemphigus vulgaris with their ages were ranged from 30 to 60 years. That group was received Polarized Light therapy in addition to their routine of medications (systemic steroids). Group (B): The study group included eleven patients that had pemphigus vulgaris with their ages were ranged from 30 to 60 years. That group was received their routine of medications (systemic steroids). Wound assessment by periodontal probe, Pain assessment by VAS scale were assessed before and after treatment. The collected data was analyzed and compared at the base line and the end of intervention.
Results: The results showed that there was a statistically significant difference between the groups before and after treatment on all outcome measures assessed. Post-test mean values for all assessed variables also revealed substantially significant differences favouring the group (A) ($P< 0.05$)
Conclusion: It was concluded that Polarized Light therapy had significant improvement in all variables (wound measurement, pain assessment.
Keywords: Pemphigus vulgaris, Polarized Light therapy, Wound healing, VAS
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INTRODUCTION

Pemphigus vulgaris (PV) is an autoimmune disease that results in blisters on cutaneous and mucosal surfaces. Pemphigus is derived from pemphix, the Greek word for blister. Pemphigus was first described in 1788 by Stephen Dickson, who observed a patient with a blister on her tongue. Although PV has not been shown to be contagious as initially thought, there have been possible triggers identified that might induce PV in patients with other autoimmune disorders (Patel et al., 2017).

PV most commonly affects the oral mucosa but may involve any area of the stratified squamous epithelium. The frequency of ear, nose, and throat (ENT) involvement in PV has been studied before in several studies (Kavala et al., 2011) and case reports. This is of particular interest to our medical center, which is a tertiary referral hospital for all of Egypt (population ~80 million) (El-Darouti et al., 2009).

The estimated incidence of PV is between one and five cases per million every year. Its prevalence is higher in individuals of Ashkenazi Jewish, Mediterranean, Indian, Malaysian, Chinese and Japanese descent. It is the most common subtype of pemphigus in Europe, the United States, and Japan; it usually affects women and most of the patients are 50-60 years of age. Though rare, some childhood cases have been reported (Alpsoy et al., 2015).

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Incidence of pemphigus vulgaris is increasing among Egyptians; a new study has proved the presence of anti-Dsg3 antibodies in 40 normal population sera out of 200 people (Saleh and El-Bahy, 2015).

Exposure to certain medications like penicillamine and captopril can trigger PV. Such a trigger can happen through the effects on binding to molecules involved in cell adhesion, influence on enzymes that mediate keratinocyte aggregation, and by stimulating neoantigen formation. Furthermore, nonsteroidal anti-inflammatory agents, penicillin, and cephalosporins have also been associated with drug-induced PV (Feng et al., 2011). Finally, controversial case reports associating PV with certain foods like red wine, garlic, leek, and peppers exist, though such an association is not supported by robust evidence (Ruocco et al., 2013)

Although a number of different treatment modalities have been recommended so far, treatment of PV is usually symptomatic, therefore showing low predictability. Most treatment modalities are conservative/pharmacological, such as systemic corticosteroids, immunosuppressant or immunomodulatory agents, corticosteroids being widely accepted as the primary treatment of choice (Scully and Challacombe, 2002).

However, corticosteroids are limited by various time and dose dependent adverse effects. One of the main drawbacks of corticosteroids is the long-term application treatment, which can be difficult on the oral mucosa, causing further frequent relapses upon the treatment's cessation and often requiring steroid sparing agents (Minicucci et al., 2012).

Polarized polychromatic light therapy is a low-power light source as well like laser therapy. However, rather of being monochromatic and coherent light beam, polarized light is polychromatic and non-coherent. Further, compared to laser therapy linear polarized polychromatic light therapy is less expensive and does not necessitate the same safety measures for both the patient and the therapist and allows wider areas to be irradiated as opposed to the small diameter of the laser beam (Raeissadat et al., 2014).

Bioptron light therapy (BLT) has been utilized as a non-invasive treatment for wound healing, skin ulcers, and various musculoskeletal conditions. It involves the use of a low-level laser as a coherent light source). BLT's efficacy as either a monotherapy or an adjunct treatment for pain management in several indications, including orthopedic physical therapy (OA, RA, chronic arthritis), rheumatology (osteoarthritis, rheumatoid arthritis), and conditions such as LBP, shoulder and neck pain syndrome, and issues related to scar and muscle tissues (Nobuta et al., 2018).

The aim of this study was the evaluation of the efficacy of polarized light therapy in the treatment of pemphigus lesions.

MATERIAL AND METHODS:

Study design:

The study was designed as randomized, controlled trial, pre, and post-experimental design study. It was approved by the Research Ethical Committee of The Faculty of Physical Therapy, Cairo University. A written consent form was obtained from patients before participation in this study.

Participants:

A total number of Twenty- patients diagnosed as had oral pemphigus vulgaris were selected randomly from kasr al ainy hospital. They were assigned into two equal groups; They were selected according to the following criteria: Inclusion criteria: The age of the patients was ranged from30 to 60 years. All patients had a minimum of 2 ulcers or erosions, The lesion present on mouth, Ulcer not less than 1 cm, all patients had the same medical care and free from any pathological conditions that might affect the results, all patients should be conscious and ambulant. Exclusion criteria: Patients who had any injury on oral cavity, Skin sores close to the thyroid gland, facial sores near the eye and infectious sores, Inability to understand the written and verbal instruction, Patient with diabetes.

Randomization

All participants agreed to an informed consent form before the beginning of the study, anonymity and privacy were guaranteed, and all the methods were done consistently with relevant laws and institutional rules. Participants were equally divided into two groups (control and study groups) equally by a computed randomization program.

Interventions:

The subjects divided randomly into two groups equal in number, (group A) and (group B):

Group (A): The study group included ten patients that had oral pemphigus vulgaris with their ages were ranged from 30 to 60 years. That group was received Polarized Light therapy in addition to their routine of medications (systemic steroids).

Group (B): The study group included ten patients that had oral pemphigus vulgaris with their ages were ranged from 30 to 60 years. That group was received their routine of medications (systemic steroids).

For treatment:

Preparation of patients:

Each subject was examined medically in order to exclude any abnormal medical problems which previously mentioned.

Each subject's history was taken in previously prepared questionnaire to collect information about, name, age and determination about any functional, social, psychological problems.

Each subject was explained the procedures and was not felt of any things (heat or pain).

Ensured the patient was placed in comfortable and relaxed position (supine or sitting leaning backward with back support).

The area should be easily accessible and stable therapy.

Applications of Polarized Light therapy Group A (study group):

Application: point the light beam of bioptron light therapy (BLT) at the area to be treated, holding the device at right angle (90°) perpendicular to the surface of the treated area and maintaining a distance of 10 cm for the BLT from the surface of it (oral lesion) and applying the BLT for about

10 minutes. Frequency of application: applied daily for 30 days (Brem et al., 2007).

Group B:

That group was received their routine of medications (systemic steroid)

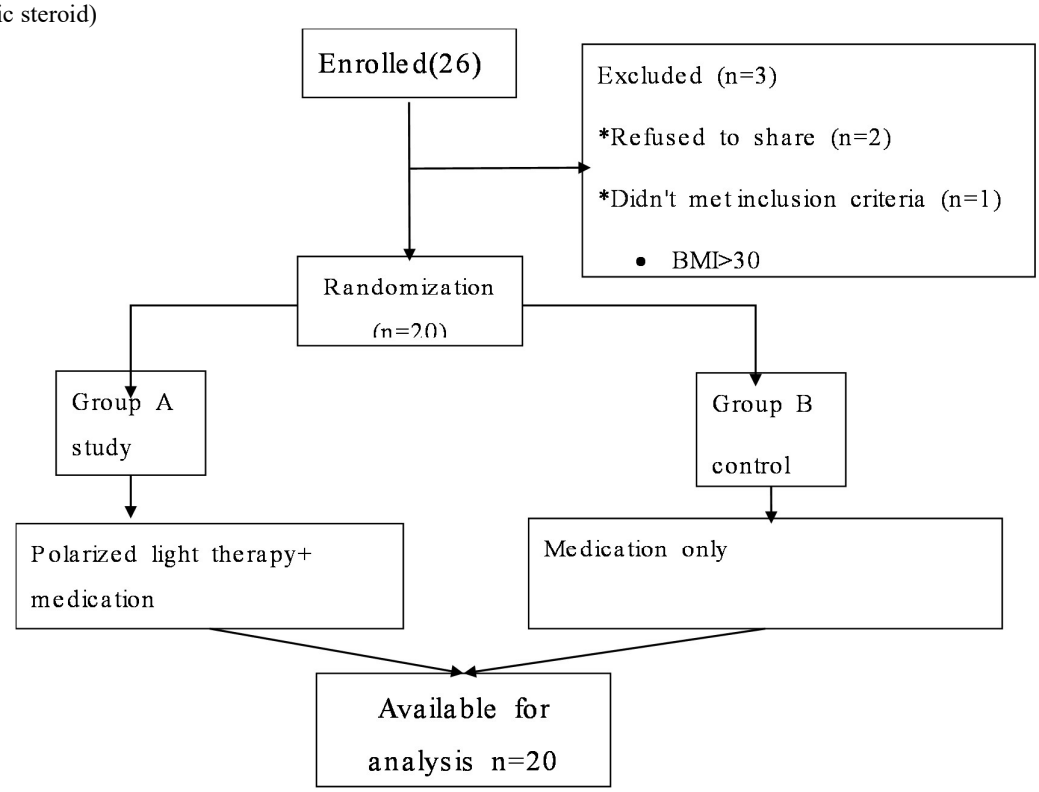

Fig (1): Flow chart of study participants

Outcome measures:

1-Wound assessment:

Oral lesions were measured through a periodontal probe to score the diameter length (mm). The scoring was performed on day 1 (immediately before the beginning of treatment and the end of treatment after 4 weeks).

2- Pain Assessment by Visual Analogue Scale (VAS):

The VAS represents a pain rating instrument first utilized by Hayes and Patterson in 1921. Clinical and epidemiologic research applications commonly employ this scale for measuring various symptom intensities or frequencies. Pain experiences, as an example, span a continuous range from absence to extreme levels. Patients experience this range as uninterrupted—their pain does not exhibit discrete categorical shifts as suggested by classifications such as none, mild, moderate, and severe. VAS was designed to capture this continuous underlying concept (Delgado et al., 2018).

Scoring involves using a ruler to measure the distance (in millimeters) along the 10-centimeter line between the "no pain" marker and the patient's indication, yielding scores spanning 0–100. Increased scores reflect higher pain intensity levels. Pain distribution assessment employs VAS scores among post-operative patient populations (Weigl and Forstner, 2021).

Statistical tools and data analysis:

In this study, the obtained data was recorded.

These data were transferred into IBM card using IBM personal computer with statistical program to obtain the following statistical tools:

Descriptive statistics:

In this study, the descriptive statistics inform of mean, and standard deviation was calculated for all participants of the study to determine the homogeneity and central deviation.

-Analytic statistics:

In this study, the mean, standard deviation and standard error was calculated for all variables.

paired “T" test was used to compare between data of the two groups.

Comparison was applied by student T test to compare between the independent means.

A value of $p<0.05$ was considered statistically significant.

RESULTS:

(1) Groups A (study), and B (control) were compared before therapy. Table 1 shows that all two groups had similar pre-treatment mean ± SD values for all quantifiable variables, with a p-value greater than 0.05.

(2) Evaluation of the A, and B groups both before and after therapy. Table 1 shows that all quantifiable variables,

when compared across the three groups before and after treatment, had mean ± SD values ($p < 0.05$).

(3) Comparing the two groups after therapy. Table 1 shows that all measured variables' post-treatment mean ± SD values were compared among the two groups ($p < 0.05$).

Table 1. Comparison of wound measurement and VAS for two groups (A and B).

		Group (A) (mean ± SD)	Group (B) (mean ± SD)	t-value	p-value
Wound measurement	Before treatment	12.9 ± 4.53	14.3 ± 9.98	0.4	0.693^{NS}
	After treatment	4.1 ± 2.38	10.7 ± 8.54	2.35	0.04^{S}
	% of change	68.2%	25.17%		
	t-value	11.85	6.41		
	p-value	0.0001^{S}	0.0001^{S}		
VAS	Before treatment	6.2 ± 2.34	5.5 ± 1.35	0.82	0.428^{NS}
	After treatment	1.8 ± 1.13	3.6 ± 1.64	2.85	0.012^{S}
	% of change	70.96%	34.54%		
	t-value	10.31	10.58		
	p-value	0.0001^{S}	0.0001^{S}		

$\overline{X}$: Mean. SD: Standard Deviation. % of change: Percentage of change.
t-value: Paired and Un-paired t- test value. P-value: Probability value.
NS: Non-Significant. S: Significant.

DISCUSSION:

In this study, pain severity based on VAS score as well as wound assessment evaluated by periodontal prob showed a significant improvement in 4weeksafter the beginning of the treatment in both the groups. However, patients receiving additional treatment with photo biomodulation showed a faster and more effective improvement of symptoms and oral signs, compared with patients undergoing exclusively pharmacological therapy.

At the best of our knowledge, no studies evaluated the effect of Bioptron light therapy on patients with pemphigus vulgaris. The positive effects of photo biomodulation on the oral pemphigus vulgaris frequently concern the use of the laser technology

Our results were conducted with de Carvalho et al.,2015 demonstrated the laser and light emitting diode photobiomodulation efficacy on an animal model in accelerating the healing of formocresol-induced oral ulcers in both clinical and histological aspects. Also, in BMS patients, the photo biomodulation induced by LLLT significantly reduces the symptoms and represents an alternative to the conventional treatment regimens (dos Santos et al., 2015).

However, the photobiomodulation induced by Bioptron differs in several aspects from that induced by LLLT. In particular, the light used by the Bioptron technology is polychromatic and noncoherent although it is polarized such as the laser light. These characteristics allow to treat a larger area with a wider wave-width spectrum. Further, Bioptron use requires a simpler and quicker learning curve (Heiskanen and Hamblin, 2018)

Wound healing and tissue repair, pain relief, and reduction on inflammation are the main clinical outcomes observed in several studies when photobiomodulation was used (Arany, 2016). The bi ological mechanisms that support the clinical effects are related to the upregulation of basic fibroblast growth factor [hepatocyte growth factor (HGF) and stem cell factor (SCF)], enhance ment of cellular metabolism and vascularization (vascular endothelial growth factor increased production), cellular migration and differentiation, and an increased synthesis of various proteins involved in oxidative stress reduction, nociceptive pain transmission, and infection control (Feehan et al., 2018).

Light therapy can help chronic oral ulcers healing process by stimulating the epithelial cells proliferation and migration, as well as improving blood flow into the affected site. These processes are mediated by the increase of some cytokines, especially IF-1b, TNFa, and MVP, which activate endothelial, fibroblastic, and epithelial growth factors themselves (Wagner et al., 2016). However, rather than analyzing separately the photo biomodulation effects on every single oral pathological condition, it would be appropriate to suppose that all the different biological mechanisms activated by the irradiation with Bioptron light act synergically in the clinical improvement of the analyzed patients.

Our findings were supported by Kipshidze et al., 2001 who reported that polarized light enhanced microcirculation and increased the growth factors required to form new blood vessels. Consequently, it improved the healing and epithelialization process, particularly in the case of infected wounds.35,36

Our results were consisted with Mohamed et al., 2019 concluded that Bioptron light treat-ment for 8 min per session, 3 times per week for 2 months, enhances wound healing and decreases interleukin (IL)-6 levels in DFUs.

Our results were in line with Đurovic´ et al., 2008 showed that the use of polarized light as adjunctive therapy for pressure ulcers was effective, with 20 patients with stage I–III ulcers showing significant improvement in the healing process after 1 month of treatment.

The findings of this study are reinforced by the findings of El-Deen et al., 2014 who examined the effects of Bioptron light therapy versus light-emitting diode therapy on DFUs and reported that both therapies appear to be successful in treating wounds, while polarized light therapy, which was applied for 8 min, 3 times per week, for 2 months, was more effective than light-emitting diode therapy in speeding up healing and reducing hospitalization time.

Our results were agreed with Stasinopoulos et al., 2005 conducted a preliminary, prospective, open clinical trial to assess the efficacy of polarized polychromatic noncoherent light (Bioptron light) in the treatment of idiopathic CTS. In that study, 25 patients with mild to moderate CTS lasting >3 months received bioptron light three times weekly for 4 weeks. Outcome measures used were the participants' global assessments of nocturnal pain and paresthesia at 4 weeks and 6 months, respectively. Nocturnal pain and paresthesia associated with CTS improved during Bioptron light treatment. However, due to the absence of control group, they could not conclude that these findings were due to the Bioptron light treatment intervention itself rather than to probable natural improvements in symptoms. Furthermore, they evaluated symptoms improvement only subjectively and no electrophysiological studies were included. The strong point of our study was that we evaluated the efficacy of Bioptron both clinically via VAS score and by performing electrophysiological studies.

In contrast, a study conducted by Abdel-Mageed et al., 2015 found that the effects of polarized light as adjunctive therapy in treating deep second-degree burns were not appropriate and statistically insignificant, but wound healing showed slight improvement; this contradiction may have arisen as a result of the limited study time (3 weeks) and assessment of wound surface area only without an assessment of the wound volume

CONCLUSION:

It was concluded that polarized light therapy had significant improvement in all variables (wound measurement, pain assessment).

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