

Psoriasis Treatment by Using Narrowband-UVB Phototherapy

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Abstract

Ultraviolet light radiation is applied to treat Plaque Psoriasis disease by targeted phototherapy. This is available through Narrowband-UVB light radiation devices peaked at wavelength 311 nm. Ten cases were chosen as a study group, 8 males aged 22-40 years old, and 2 females aged 25 and 32 years old who were exposed to ultraviolet light radiation. Their recovery or improvement was followed weekly. Different doses were used according to the severity of the lesion and as a trial for the outcome. The dose was given two times a week, starting with 200mJ/cm² and subsequently increased by 100 or 200 mJ/cm² reaching a maximum dose as tolerated by each individual patient. Improvement was observed after 4 – 6 weeks. The patient stays in the treatment cabinet for a few seconds to several minutes according to the individual case which depends on the area of the body being treated. Treatment was stopped for two patients due to in toleration to the recommended dose. It was observed that good treatment results were obtained for the other 8 patients. The recovery rate from the disease was in the range of 50-100%. This is depending on the duration of the occurrence of the disease and the reduction of the size of the affected area on the skin for each individual patient after treatment.

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1. Introduction

Psoriasis is a disease that affects the human skin. There are several types of psoriasis, including plaque psoriasis, erythrodermic psoriasis, nail guttate, inverse psoriasis, pustular psoriasis, and psoriatic arthritis. Psoriasis appears in elbows, knees, lower back, and scalp [1]. This disease is either treated by medication (drugs) or by ultraviolet phototherapy [2]. Phototherapy is exposing the affected area to different doses of bright light. It is prescribed primarily to treat skin, which involves exposing the skin regularly to specific wavelengths of ultraviolet light under medical supervision. Broadband ultraviolet (UVB) 280–320 nm, and Narrowband ultraviolet 311–313 nm, are two types of UV [3]. In the late 1970s, dermatologists began utilizing radiation because of its safety and effectiveness. It removes skin faster and delays remission. The narrowband therapeutic wavelengths in the ultraviolet spectrum are anticipated to differ in their effect from the broadband wavelengths [4].

Since antiquity, solar UV has been utilized to treat various ailments. This has a scientific basis because UV interacts with the epidermis's tissue cells and absorbs a vast number of chemicals (chromophores) in different layers of the skin. These interactions are beneficial but may have harmful biological consequences. The majority of the healthy benefits of solar radiation are mediated through UVB inducing the synthesis of vitamin D in the skin [5]. Phototherapy has recently emerged as a promising therapeutic option for psoriasis [6]. When UVB radiation reaches the skin's epidermis and upper dermis, it is absorbed by DNA, epidermal chromophores such as trans-urocanic acid (trans-UCA), and cell membranes [7]. DNA photoproducts, predominantly pyrimidine dimers, are formed when UVB is absorbed by nucleotides. The rate of DNA synthesis is slowed by UVB exposure. UVB light also promotes photoisomerization of trans-UCA to cis-UCA, which suppresses the immune system. UV radiation can also alter extra-nuclear molecular targets in the cytoplasm and cell membranes (cell surface receptors, kinases, phosphatases, and transcription factors). NB-UVB affects keratinocytes, circulating and cutaneous T lymphocytes, monocytes, Langerhans cells, mast cells, and fibroblasts. Local and systemic immunosuppressive effects are also induced by NB-UVB, which may contribute to the favorable benefits of this light source [7]. This study is carried out to determine the NB-UVB light radiation exposure-response progresses among Guttate type psoriasis patients attended for treatment at Dermatological Diseases Center situated in Baghdad city, Iraq.

1.1. Ultraviolet production

Ultraviolet is found in nature, radiated from sunlight. Most of it is absorbed by the earth's atmosphere, due to the presence of the Ozone layer. Therefore; it is considered unuseful in the field of medicine [8]. While that was designed and manufactured for producing UV radiation, found more applicable than that dained from the Sun. These are coming either from Xenon arc lamps or from fluorescent cylindrical Narrowband B lamps designed according to their purposes. Electrical current is passed through a vaporized mercury, leading to the production of UV radiation [8]. The UV light is usually produced in the range of (10–400) nm, and peaks at 311nm (Narrowband). Details of the spectrum are shown in Fig.1 [8].

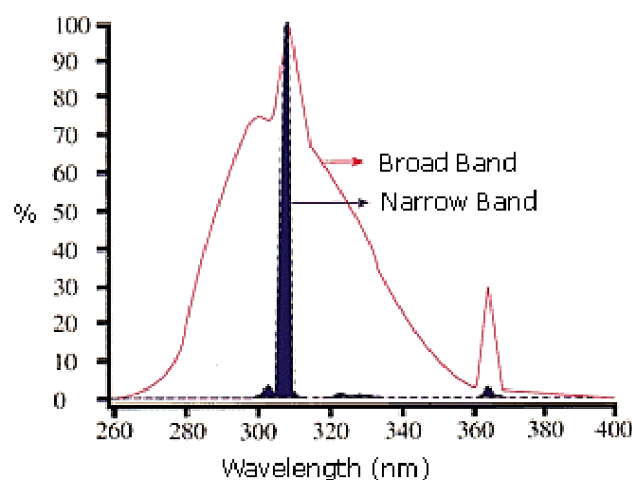


Figure 1: Characteristic UV wavelength showing both narrowband and broadband ultraviolet spectrum peaks at 311nm.

Accordingly, the narrowband ultraviolet spectrum at 311 nm, is essentially effective and adopted by physicians for use in the medical field in treating skin diseases

disorders [9]. One of the manufactured devices used for this purpose is the curved cage designed to treat Psoriasis diseases, is as shown in Fig.2 [9].



Figure 2: Narrowband UV cage device used to treat Psoriasis disease.

1.2. Symptoms and causes

As regards to the causes of psoriasis, it is a condition of autoimmune diseases. Autoimmune disorders are caused by the body's antibodies destroying itself [10]. T lymphocytes, which are white blood cells, attack skin cells in psoriasis. However, psoriasis symptoms vary from person to person, depending on the type of psoriasis. Psoriatic lesions can be minor or huge, such as a few scabs on the scalp or elbow, or they can cover vast sections or the majority of the body [11].

Symptoms of the disease are soreness around patches, plus itching and burning sensation associated with painful joints. Meanwhile, the signs of psoriasis are red, raised inflamed patches of the skin, whitish-silver scales or plaques on the red patches; thick, pitted nails, swollen joints, and removal of the scales leads to bleeding which is considered as pathognomonic sign in the diagnosis of psoriasis [12, 13].

There is an alternative procedure dealing with Psoriasis disease, by using therapeutic medicine (Corticosteroids as a soothing agent). A combination of phototherapy and therapeutic treatment is used, but recently it is found that phototherapy is a preferable treatment [14].

2. Experimental work

Ten cases of patients complaining from Guttate Psoriatic were chosen on the basis of a trial sample experiment. These were 8 males aged 22-40 years old, and 2 females aged 25 and 32 years old, from Dermatological Disease Center in Baghdad, Iraq, as experimental trial cases. They attended for treatment by ultraviolet light radiation dose. They were exposed twice weekly to different doses of 311nm UV light for four to six weeks. The session time of exposure was a few seconds to several minutes inside UVB cabinet. Improvement or adverse effects of the procedure were recorded.

3. Results and discussion

Results obtained in this work are listed in Table 1. The results show the rate of skin clearing for the 10 selected patients with moderate psoriasis subjected to NB-UVB. Patients received treatments two times per week at a starting dose of 200 mJ/cm², 300 mJ/cm², or 400 mJ/cm², increasing the dose by 100 or 200 mJ/cm² at each session, up to a maximum dose as tolerated by the patient depending on the type of skin. After four to six weeks, a significant reduction in psoriasis in some cases reached 100% were

detected. To see a considerable improvement in their skin, patients with mild psoriasis need 8–12 sessions of NB-UVB phototherapy at a frequency of two sessions per week. Each phototherapy session lasts a few seconds to several minutes; however, some patients may require up to 30 minutes of preparation time. Sessions must be separated by at least 24 hours. In addition, for the first year of treatment, a physician visit is required every three months and every six months then after. The duration of occurrence of diseases was 2-3 months, involving small areas of affected skin.

Two cases left the exposure treatment to UV, those were females aged 25, 32 years old. Their duration of complaining of the disease was more than 10 years with relapse and remission extending to larger areas of affected skin. They discontinued treatment, most probably, due to emotional and psychological factors with sorrowful feelings. Results after the application of Narrowband UV radiation gave good outcomes regarding Guttate Psoriasis treatment.

Table 1: Clinical characteristic of a patient with plaque Guttate psoriasis who underwent NB-UVB therapy.

Patient No. Male (M) Female (F)	No. of years with psoriasis	skin surface area before treatment (cm ²)	skin surface area after treatment (cm ²)	skin percentage area improved %	Maximum dose (mJ/cm ²)	Side effects
1 M	3	11	0	100	1731	Nil
2 M	4	18	3.5	80	1040	Nil
3 M	6	35	7	80	1920	itching
4 F	8	35	discontinued	discontinued	1111	Burning and pain
5 M	5	53	18	80	1000	itching
6 M	3	53	0	100	1030	Nil
7 F	9	55	discontinued	discontinued	1322	Burning and pain
8 M	5	69	7	90	1742	pain
9 M	10	70	18	75	1835	Nil
10 M	11	70	35	50	2333	itching

4. Conclusions

The study concluded that the effect of exposure to ultraviolet light in the treatment of psoriasis diseases was good, especially in the Guttate Psoriasis type. The outcome of eight cases from ten showed improvement. Two cases discontinued treatment sessions due to intolerable dose exposure and the longtime of having the disease.

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Conflict of interest

The authors declare that they have no conflict of interest.

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علاج الصدفية باستخدام الحزمة الضيقة للأشعة فوق البنفسجية نوع UVB-

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الخلاصة

تم استخدام ضوء الأشعة فوق البنفسجية لمعالجة مرض الصدفية المستقر بواسطة العلاج الضوئي الموجه المتوفر باستخدام الاجهزة المتوفرة للحزمة الضيقة للأشعة فوق البنفسجية نوع UVB - والتي تبلغ ذروتها عند الطول الموجي 311 nm. تم اختيار عشرة حالات مرضية كمجموعة لدراستنا 8 ذكور تتراوح اعمارهم بين 22 - 40 سنة و 2 اناث اعمارهم 25 و 32 سنة والذين تم اخضاعهم للعلاج بهذه الطريقة. تمت متابعة حالاتهم الشفائية والتحسنية اسبوعيا. المرضية او شفائهم من المرض. تم اعطاء الجرعة العلاجية بواقع مرتين في الاسبوع ابتداء من 200 mJ/cm^2 وبزيادة $100\text{-}200 \text{ mJ/cm}^2$ لتصل الى اعلى جرعة تحمل لكل مريض لمدد زمنية تتراوح بين بضعة ثواني الى عدة دقائق داخل غرفة العلاج وفقا لكل حالة والتي تعتمد على مساحة الجزء المصاب المراد معالجته. لقد تم رصد حالات تحسن بعد مرور 4-6 اسابيع من بدء العلاج لثمانية مرضى وايقاف العلاج لاثنتين من العينة بسبب عدم تحملهم للجرعة العلاجية المقررة. بلغت نتائج معدلات التحسن والشفاء من المرض تراوحت بين 50-100% والتي اعتمدت على مدة حصول المرض والمساحة المصابة المختزلة للجلد لكل مريض بعد انتهاء فترة المعالجة.