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PHOTOTHERAPY IN PSORIASIS

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ABSTRACT

Phototherapy is a kind of therapeutic described for the treatment of various dermatological disorders including psoriasis. Conventional phototherapy uses a whole body cabinet or body part machine such as hand, foot or scalp machines. Targeted phototherapy includes the use of ultraviolet light which can be focused on specific body areas or lesions. Targeted phototherapy includes excimer laser, intense pulse light system (IPL), photodynamic therapy and ultraviolet (UV) light source with a sophisticated delivery system which is easy to be operated by hands. PUVA uses a psoralen derivative in conjunction with long wavelength ultraviolet A (UVA) light (sunlight or artificial) for photo-chemotherapy of various dermatological ailments. Ultraviolet light is an effective and relatively safe modality and is a valuable tool in the treatment of psoriasis. NB-UVB phototherapy is considered the first line treatment for extensive plaque type psoriasis. The present article has discussed a brief review on various common phototherapy modalities which include conventional phototherapy, targeted phototherapy, photo-chemotherapy (PUVA) and photodynamic therapy.

KEYWORDS: Phototherapy, Targeted phototherapy, Psoriasis, PUVA, Photodynamic therapy.

INTRODUCTION

Topical therapies, such as topical corticosteroids, vitamin D analogues, etc. are used as first line treatment and can be prescribed in primary care. Second-line therapy includes phototherapy which is used to treat moderate to severe psoriasis and psoriasis that does not

respond to topical therapy. Systemic non-biological agents such as methotrexate should usually be prescribed by a specialist dermatologist. Biological agents such as adalimumab, etanercept, infliximab are usually prescribed by specialist dermatologist in secondary or tertiary care settings.[1]

Phototherapy used for the treatment of different skin conditions by using different wavelengths of ultraviolet (UV) light. These are either UVA (shorter wavelength) or UVB (longer wavelength). Most commonly used phototherapies include PUVA (UVA light + psoralen), Broadband UVB phototherapy (which emits a broad range of light, including some harmful rays) and Narrowband UVB phototherapy, which emit wavelengths concentrated in the therapeutic range.[2]

In 1672, Newton discovered the spectrum of visible light and subsequently ultraviolet light was discovered in the early 1700s. The history of modern phototherapy begins in 1898, when lupus vulgaris (skin tuberculosis) was treated with UV light by a Danish physician Niels Ryberg Finsen. He used a carbon arc source to treat lupus vulgaris. In the beginning he used only natural sunlight, but because sunlight at the latitude of 55°N is not so plentiful, he soon changed over to the use of artificial light sources. He was consequently honored with Nobel Prize for his great work in 1903.[3-5]

Goeckerman introduced his regime, artificial broadband UVB + coal tar for the treatment of psoriasis in 1923. In 1953 Ingram used a new combination of regime which include artificial broadband UVB and dithranol. In the recent years the development of irradiation devices with new emission spectra has led to an expanded role for phototherapy in the treatment of dermatological disorders and is best illustrated by the increasing frequency with which 311-nm ultraviolet B (UVB) phototherapy is employed for the treatment of psoriasis.[6]

Various types of phototherapy modalities with their spectrum are tabulated below.[7]

Table. 1. Modalities and methods of phototherapy

Method of phototherapy	Abbreviation	Spectrum (nm)
Natural (solar) phototherapy	Heliotherapy	UV, visible light, IR
Broadband UVB	BB UVB	290-320
Narrowband UVB	NB UVB	311-313
Selective UV phototherapy	SUP	300-330
Monochromatic excimer light	MEL	308
Broadband UVA	BB UVA	320-400

Photo-chemotherapy PUVA	PUVA	320-400
Extracorporeal photo-pheresis	ECP	320-400
UVA 1 phototherapy	UVA 1	340-400
High energy visible	HEV	400-500
Intensive pulse light	IPL	515 (-1250)
Photodynamic therapy	PDT	600-750
Light emitting device	LED	630 and 830

MODALITIES OF PHOTOTHERAPY

Commonly used phototherapy modalities may be summarizes in to four categories which include conventional phototherapy, photo-chemotherapy (PUVA), targeted phototherapy and photodynamic phototherapy.

Phototherapy (conventional phototherapy)

Phototherapy involves exposure to ultraviolet radiations by means of special equipment using fluorescent light source emitting specific wavelength of radiation. UV acts by reducing cellular proliferation and modifying the immune response. Conventional phototherapy is an excellent, safe and appropriate treatment for carefully selected patients of psoriasis with >15%-20% body surface area involved, or focal debilitating palmo-plantar psoriasis. It uses whole body cabinet or body part machine such as hand, foot or scalp machines.

Various indications for phototherapy includes psoriasis (moderate to severe), atopic dermatitis (moderate to severe), lichen planus, pityriasis lichenoides, para-psoriasis, photodermatosis, mycosis fungoides (cutaneous T-cell lymphoma), pityriasis rosea, pruritic eruptions of HIV infection, pruritus and chronic urticaria.

There are two types of UV light therapy is available viz. UVA and UVB. UVB is further categorized in to broad band UVB (BBUVB) and narrow band UVB (NBUVB). UVA penetrates deeper into the skin than UVB.[8] Treatment with UVA typically takes 20 minutes for a session. UVA light used with psoralen drugs is called PUVA. With PUVA, the treatment time is greatly reduced, from 20 minutes to about 2 minutes. Exposure time of UVB at the beginning is 30 to 60 seconds. The exposure continues till it leads to the skin to turn slightly pink. When the skin no longer turns pink in the 24 hours after a treatment, the exposure time is increased.[9]

The most commonly used method of phototherapy for psoriasis is NBUVB due to its relatively good efficacy, cost, availability and minimal side effects. Other reasons also

include its simplicity of performance over PUVA both for patients and for medical staff. A significant decrease in the use of PUVA is caused not only by the introduction of NBUVB, but also by the availability of biologics. Typical regimens for NB-UVB involve dosing 3 times per week for at least 3 months.

The phototherapy leads to clearance in 63%-80% of patients with a course of NBUVB and in general can achieve PASI 75 on average in 75% of patients after 4-6 weeks of treatment which is very effective when compared with systemic drugs and even with biologics. Optimization of protocols and or combination of phototherapy with topical or systemic agents leads to improved efficacy.[10-11] Balneo-phototherapy is quite popular in Germany. The therapy mainly uses the salt baths in asynchronous or synchronous way with NBUVB, SUP or BBUVB.[12]

NB-UVB can be combined with all current topical agents depending upon clinical condition and outcome. The most common topical agent used in combination with NBUVB is dithranol for in-patient and calcipotriol for out-patient.[13] Combination of NBUVB with systemic drugs is represented mainly by retinoids, e.g., acitretin (reNBUVB), because it has no immunosuppressive properties and results in the reduced amount of phototherapy sessions required to achieve clearance.[14-15]

Phototherapy has become a more viable, accessible, and effective option in the treatment of inflammatory dermatological disorders with the development of various new irradiation devices that utilize specific parts of the electromagnetic spectrum. The most commonly used forms of UV irradiation are UVA1, PUVA and NB-UVB. Each of these modalities differs in their mechanism of action, indications and side effect profiles. Now day's phototherapy is a valuable option also in the treatment of many non-psoriatic conditions including atopic dermatitis, sclerosing skin conditions such as morphea, vitiligo, and mycosis fungoides. Phototherapy may be used in most populations, including children and pregnant women due to its relative safety. However, contraindications and side effects are known and should be considered before patients begin a phototherapeutic regimen.[16]

The use of NB-UVB phototherapy for the treatment of psoriasis at therapeutic dose is less erythemogenic than other wavelengths in the UVB range.[17] Usually the UVB Phototherapy light or PUVA is used as first-line treatment for widespread lesions and may also use as second-line treatment when topical therapy is insufficient. The eyes need to be protected with

special glasses during UVB treatment in order to prevent eye damage. Treatment is ussually limited to 2-4 weeks. The long term treatment might be associated with aging of the skin, burning and potentially an increase in skin cancer.[18] Narrow band UVB therapy is a relatively safe and effective for the treatment of moderate to severe psoriasis.

UVB therapy is valuable for plaque type of psoriasis and may be especially valuable in guttate and 'seborrhoeic' types. It is usually of little value in psoriatic erythroderma and generalized pustular psoriasis and may aggravate these forms.

Photo-chemotherapy (PUVA)

PUVA includes the combined use of a topical or oral photo-sensitizer (psoralen) with UVA radiation therapy which results in effective treatment with a significant duration of remission. Thus, the PUVA is based on the interaction between UVA radiation and psoralen.

PUVA = Psoralen + UVA

A psoralen compound, usually 8-methoxy psoralen (8-MOP) is taken orally one to two hours before treatment to UVA. It is use in a dose of 0·6–0·8mg/kg body weight. 5-Methoxypsoralen (5-MOP) is also used as an alternative, particularly in patients who developed itching or nausea with 8MOP.[19]

The indication for PUVA includes moderate to severe, especially severe psoriasis, severe form of para-psoriasis, moderate to severe atopic dermatitis, acute/chronic pityriasis lichenoides, chronic urticarial, eczema (severe), lichen planus, morphea and localized skin lesions associated with scleroderma, mycosis fungoides (cutaneous T-cell lymphoma).

In PUVA the drug (usually psoralen) is photo-activated in the skin by ultraviolet radiation (UVA). An oral dose of 8-methoxypsoralen or 5-methoxypsoralen (wherever required) is followed by exposure to long-wave ultraviolet radiation (320–400 nm). The psoralen reaches the skin and forms photo-adducts with DNA pyrimidine bases and cross-links between complementary DNA strands in the presence of UVA which in turn inhibits DNA synthesis and blocks epidermal cell division (cell proliferation).[20]

PUVA is generally considered more effective than targeted phototherapy for the treatment of psoriasis. However, the requirement of systemic exposure and the higher risk of adverse reactions (including a higher carcinogenic risk) have generally limited PUVA therapy to patients with more severe cases.

Common side effects of PUVA include nausea, headache, fatigue, burning sensation and itching especially due to oral psoralen. Long-term adverse effects include squamous -cell and melanoma skin cancers. It should be avoided in children, pregnant and lactating women, patients with hepatic, renal and severe cardiovascular disorders and aggravation of disease treated with PUVA.[21]

Recently it has been found that long term use of PUVA chemo-phototherapy in the treatment of psoriasis has serious negative effects and increases the risk of skin cancers including malignant melanoma.[22] Photo-chemotherapy is also used in combination with oral retinoids, such as acitretin which results in the reduced amount of phototherapy sessions required to achieve clearance.[23]

Targeted phototherapy

It is a therapeutic method which used a device that delivers laser light or ultraviolet light spectrum of a specific wavelength which focused on specific body areas or lesions. It includes various technologies such as excimer laser, intense pulse light system (IPL), photodynamic therapy narrow band (NB)-UVB devices and psoralen plus ultraviolet A (PUVA).[24]

General indication for targeted phototherapy includes mild to moderate localized psoriasis that is unresponsive to conservative treatment and moderate to severe psoriasis comprising less than 10% body area for which NB-UVB or PUVA are indicated.

Recommendation for the targeted phototherapy by national psoriasis foundation and American association of dermatology includes following.[25]

- For the treatment of adults or children with mild, moderate, or severe psoriasis with less than 10% body surface area involvement or for lesions localized to specific areas of the body.
- Frequency of treatment is twice per week with a minimum of 48 hours between treatments.
- Usually four to ten sessions are recommended, depending upon the clinical condition and outcome.
- Only medical professionals should provide and Advise phototherapy for the treatment of psoriasis.

- AAD indicates the use of targeted phototherapy even in the children, pregnant & lactating women.

Photodynamic therapy (PDT)

Photodynamic therapy is a multi-step process (usually takes 2 days for completion) which include the application of a topical photosensitizer followed by treatment with a laser light source, e.g. methyl aminolevulinate hydrochloride (MAL) which is usually accompanied by a red light; 5-aminolevulinic acid (5-ALA).[26] More than 2 PDT treatments per year are not considered medically necessary, as effectiveness beyond this timeframe has not been established. Photodynamic therapy has been used successfully for the treatment of inflammatory dermatological disorders like psoriasis and precancerous and malignant conditions such as basal cell carcinoma, Bowen's disease, superficial squamous cell carcinoma and actinic keratosis.[27]

CONCLUSION

Since prehistoric time, the evolution of various lives on earth has taken place under the radiation of the sun. The sun can be regarded as an indispensable environmental factor in regulating many photo-biological processes via the skin and the eyes, genetic material and biological rhythms. In the era of rapid increasing use of internal medications, prophylactic and therapeutic effects of optical radiation deserve to receive much more attention.

In the recent years the advancement in the management of inflammatory dermatological disorders has become more effective. Major advances in the treatment include more effective and safer phototherapy and the use of immunosuppresants. Even in the era of biologics, phototherapy remains an important therapeutic tool that can not be replaced by any other current systemic therapeutic. Therefore, phototherapy represents an important therapeutic modality for psoriasis and other dermatological disorders due to its good efficacy, safety, patient's compliance profile and cost benefit ratio.

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