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Ultraviolet B radiation therapy for psoriasis: Pursuing the optimal regime☆

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Abstract Psoriasis is a chronic and common disease mediated by resident memory T cells that negatively affects a broad range of people worldwide. One of the oldest and most commonly used treatments is phototherapy. We reviewed the existing literature on the four main ultraviolet B (UVB) modalities of phototherapy in the management of psoriasis: heliotherapy, broadband UVB, narrowband UVB, and excimer laser and lamp. Despite the many studies done on these therapies, there is significant variation in their prescription and use. Phototherapy remains one of the most effective and safest treatments for psoriasis. We provide an updated comprehensive overview of UVB phototherapy for psoriasis to help physicians optimize their choice of modality and dosing regimen to ensure optimal outcomes for psoriasis patients.
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Introduction

Psoriasis is a common, chronic autoimmune disease mediated by resident memory T cells, presenting with variable clinical patterns and triggers, that affects nearly 3% of the world's population. Negative effects of psoriasis include lowered quality of life and loss of work productivity, leading to financial burden.[1] Psoriasis is an independent risk factor for mortality and is linked to numerous comorbidities such as pulmonary and cardiovascular disease, clinical depression, diabetes, cancer, Crohn disease, hypertension, obesity, metabolic syndrome, hepatic disease, infections, dyslipidemia, and osteoporosis.[2]

There is a wide repertoire of treatments for moderate to severe psoriasis.[3] Existing treatment guidelines vary on their first- and second-line suggestions depending on expertise, costs, and risk-benefit considerations. The choice of treatment also differs depending on the geographic region of its use, often when traditional concepts supersede evidence-based information.[3]

Despite the wide range of current therapeutic approaches, many psoriasis patients continue to be dissatisfied with their medical care, resulting in poor compliance. Systemic therapy has a high reported rate of noncompliance, up to 40%.[4]

Ultraviolet B (UVB) therapy remains the preferred first-line treatment among American dermatologists for psoriatic patients of childbearing age, regardless of availability, geographic region, and prior treatments[5]; however, a review of the literature reveals considerable variation among published

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UVB therapy protocols. When performed appropriately and when patient-specific considerations are taken into account, UVB phototherapy can achieve up to 100% of clearance[6]; therefore, we aim to update physicians and provide evidence-based regimens for optimal suppression of disease activity, prevention of disease recurrence, and improvement in patient results, including quality of life.

Patient-specific considerations and contraindications

Phototherapy can be used when topical therapy is not sufficient. Conventionally, involvement of at least 10% of body surface area is an indication to start UVB or systemic therapy; nevertheless, in the presence of significant debilitating symptoms such as severe scalp psoriasis or severe psoriasis of the palms and soles, it is appropriate to consider targeted phototherapy or even systemic therapies for lower body surface area invovement.[5]

For moderate to severe psoriasis, phototherapy and systemic agents may be considered, either combined or alone.[3,7,8] Topical treatment is used as adjunct therapy especially for covered sites, such as the scalp or flexures, that are less responsive to phototherapy alone.[9]

Before the start of therapy, it is important to conduct an objective assessment of the disease (eg, Psoriasis Area and Severity Index [PASI], body surface area, Physician Global Assessment, presence of arthritis) and of health-related quality of life (such as the Dermatology Life Quality Index/Skindex-29 or −17). It is also essential to note contraindications (Table 1), previous courses of phototherapy, and recreational UV exposure and examine skin for dysplastic melanocytic nevi or cutaneous malignancies.[3,8]

Table 1 Contraindications[3,9,10]

Absolute contraindications	Relative contraindications
• Presence of cutaneous malignancies • Lupus erythematosus • Inherited genophotodermatoses or genodermatoses with an increased risk of skin cancer, such as xeroderma pigmentosum, Cockayne syndrome, Bloom syndrome	• Epilepsy • Dysplastic melanocytic nevi • History of melanoma or multiple nonmelanoma skin cancers • Skin type I • Poor compliance • Unfavorable logistical reasons (eg, time off work, distance, travel, or immobility) • Physical or emotional inability to tolerate therapy (heart failure—NYHA III-IV, claustrophobia) • History of arsenic intake (eg, Fowler solution)

NYHA, New York Heart Association.

To commence phototherapy, it is necessary to determine the appropriate initiating dose, which is suggested to be 50% of the minimal erythema dose (MED).[10] The MED is the lowest dose that produces a clinically just-perceptible erythema under indoor bright lighting conditions at 24 hours after UV exposure.[11] It can also be easily determined using specialized MED testing devices or formal phototesting.

For MED testing, six small areas (eg, 1-cm diameter circles) of unexposed skin, such as the buttocks or lower back, are exposed to increasing doses of broadband and narrowband UVB (eg, increasing by 20 mJ/cm^2 or in a ratio of $\sqrt{2}$ to the next).[12] The type of lamp used should be noted because the results vary with the UV source. Handheld devices are available to measure the MED in one single radiation and are more convenient and accurate.[13] Before conducting phototesting, the patient should avoid use of recreational sunlamps or sunbathing. If an MED device is not available, skin phototyping is less accurate but offers guidance for determining starting dose.

During treatment sessions, all patients should wear UV-protective goggles and a face shield, unless there is significant facial involvement, and genital protection.

Heliotherapy

Heliotherapy is defined as treatment with natural sunlight exposure. Its use is limited by geographic and seasonal variations in UV exposure; furthermore, significant reduction of psoriasis severity and long-term benefits have not been observed.[14] For optimal results, patients need a minimum of 2 hours direct daily sun exposure around midday over the threshold of 22.5 mJ/cm^2 for at least 20 exposures[15]; therefore, results are not always reliable as treatment is only feasible in certain periods of the year, and dosing varies by geographic location.

Many locations have been found to have efficacy for heliotherapy, such as high mountain sites in Switzerland,[16] the Canary Islands,[17] the Dead Sea,[18] Poland,[19] and Croatia.[20] The Dead Sea has a southern latitude with a specific angle at which the terrestrial sunlight hits the atmosphere, and the location at 360 meters below sea level causes a spectral shift and filtration resulting in mid-UVB radiation, which is within the desirable action spectrum for psoriasis clearance. This allows longer exposure periods to the therapeutic effect of UVB radiation with reduced likelihood of sunburn. Additionally, immersion in high-concentration salt water may potentiate UV transmission.[21] One-month treatments of heliotherapy in the Dead Sea achieve high remission rates, up to 87%.[22] The efficacy of this therapy has been proven with 3 hours of daily sun exposure, during any period between March and November.[22] Short-term heliotherapy of 2 weeks in the Dead Sea produced lower remission rates, with only 55% of patients achieving PASI score improvement of 75% or greater (PASI 75).[18]