Phototherapy and Photochemotherapy for Psoriasis

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KEYWORDS

• UV-B • Narrow band • Broad band • PUVA • UV mode of action

KEY POINTS

- Phototherapy of psoriasis is efficacious.
- Phototherapy of psoriasis is relatively cost-effective.
- Phototherapy may be combined with topical agents and systemic therapies.
- More than 200 PUVA therapy treatments is associated with an increased risk of keratinocytic cancers.
- The mode of action of phototherapy is via inhibition of keratinocyte proliferation, induction of apoptosis in immunocytes, and inhibition of Th1 and Th17 cells and stimulation of Th2.

INTRODUCTION

Phototherapy is a standard treatment option for psoriasis, generally applied if topical treatment modalities fail or are contraindicated or not practical, such as in extensive guttate psoriasis. Phototherapy may lead to the clearance of psoriasis in 5 to 8 weeks and has one of the highest treatment satisfaction rates compared with other treatment modalities.[1] The development of phototherapy for psoriasis was based on the observation that sunlight improves the symptoms of the disease. Natural light in combination with herbal extracts has been in use for the treatment of skin disease from the era of the Ancient Egyptians. Artificial light sources have been used for the treatment of psoriasis since the 1920s. The most frequently applied regimen for psoriasis was the combination of topical coal tar and subsequent UV-B radiation, introduced by Göckerman in 1925.[2]

Broad-band (BB) UV-B alone (wavelengths between 280 and 320 nm) has been used since the 1970s.[3] Narrow-band (NB) UV-B phototherapy using Philips (Eindhoven, The Netherlands) TL-01 fluorescent lamps, emitting between 311 and 313 nm, was introduced in 1988 for the treatment of psoriasis. BB-UV-B and NB-UV-B were shown to have common, but also different biologic effects, because NB-UV-B radiation did not suppress contact hypersensitivity responses in mice, even at seven times higher doses than effective BB-UV-B doses.[3]

In the 1970s psoralen–UV-A therapy (PUVA; 320–400 nm) was introduced. Psoralens, plant-derived photosensitizers, can be applied topically or taken orally. Subsequent UV-A irradiation causes a therapeutically beneficial phototoxic reaction in the skin.[4] PUVA therapy has anti-inflammatory and antiproliferative effects, and is highly efficacious in the treatment of psoriasis, inducing response rates from 74% to 100%.[5] PUVA is thereby one of the most effective treatment options in psoriasis; however, it is less well tolerated than UV-B phototherapy, and there is more evidence on its carcinogenic potential.

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Further forms of UV phototherapy for psoriasis are climatotherapy and balneotherapy. Climatotherapy involves daily bathing in Dead Sea water and graduated exposure to natural sunlight. Treatment is usually for 4 weeks and results in reductions in Psoriasis Area and Severity Index (PASI) scores by 75% or more. Most of the benefit of climatotherapy at the Dead Sea has been attributed to the specific sunlight spectrum at the Dead Sea.[6] Balneophototherapy, which involves salt water baths and artificial UV radiation, can be used as an alternative to climatotherapy at the Dead Sea.[6] However, the clinical effect of adding salt water to BB-UV-B was negligible.[7] Therefore, because of the heavy burden of salt on sewage and the environment, salt water baths are not recommended for home use.

For the treatment of chronic localized psoriatic plaques, localized phototherapy is available in the form of hand-held nonlaser UV-B (light-emitting diode) lamps, and the 308-nm excimer laser. The excimer laser emits monochromatic light equivalent to that of NB-UV-B with similar biologic and clinical effects.[8] Localized phototherapy was shown to be less efficacious than total body irradiation,[9] but is a practical solution for adjunctive home treatment of localized psoriasis, such as scalp, hand, or foot psoriasis.

Photochemotherapy can also be applied locally by using psoralen-containing gels or solutions (topical PUVA); this form of treatment is most often used for the treatment of psoriasis of the palms and soles.

Discussed next are the practical aspects of phototherapy of psoriasis and the mode of action as currently understood.

TREATMENT REGIMENS

Phototherapy is mostly applied in a clinical setting, in light cabinets where patients stand from a few seconds to a few minutes, two to five times a week. The starting dose of phototherapy is ideally based on the minimal erythema dose (MED) in the case of UV-B treatment, or the minimal phototoxic dose in the case of PUVA (**Table 1**).

MED is defined as the lowest radiation dose that produces just perceptible erythema on exposed skin after 24 hours. Common MEDs reported for NB-UV-B and BB-UV-B are shown in **Table 2**. Thus, at least five-times higher doses of NB-UV-B, compared with BB-UV-B, are needed for the induction of erythema. NB-UV-B doses required for the induction of hyperplasia, edema, sunburn cell formation, and Langerhans cell depletion are 5 to 10 times higher than equally effective BB-UV-B doses.[10] A more convenient approach is to base the starting dose on the skin type of the patient, although MED-based therapy is thought to be the safest regimen for the patient.

Maintenance of a slight, asymptomatic erythema throughout the treatment results in optimal clinical efficacy.[11] Treatments are continued until total remission is reached or until no further improvement can be obtained with continued phototherapy. The median number of treatments needed for clearance with UV-B is between 25 and 30 and for PUVA between 17 and 19.[12]

EFFICACY, DURATION OF REMISSION

The European S3 guideline on the treatment of psoriasis presents clearance rates for the different

Table 1
Treatment regimens

			PUVA	
		UV-B	Oral	Bath
Initial dose determination		Reading after 24 h	Reading after 72–96 h	Reading after 96–120 h
Initial dose		70% of MED	75% of minimal phototoxic dose	30% of minimal phototoxic dose
Treatment frequency		2–5 times weekly	2–4 times weekly	
Dose adjustment during treatment	No erythema	Increase by 30%–40%	Increase by 30% max. 2 times weekly	
	Minimal erythema	Increase by 20%	No increase	
	Persistent asymptomatic erythema	No increase	No increase	
	Painful erythema	Break in therapy	Break in therapy	
Resume therapy after symptoms fade		Reduce last dose by 50%, further increase by 10%		

Adapted from Pathirana D, Ormerod AD, Saiag P, et al. European S3-guidelines on the systemic treatment of psoriasis vulgaris. J Eur Acad Dermatol Venereol 2009;23(Suppl 2):52–5; with permission.