REPRINTED FROM

PSORIASIS forum

Spring 2004 Vol. 10, No. 1

A JOURNAL FOR NATIONAL PSORIASIS FOUNDATION® PROFESSIONAL MEMBERS

Initiating Narrow-band UVB for the Treatment of Psoriasis

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Narrow-band UVB is effective for the treatment of psoriasis.[3,8,10] The numerous protocols available in the literature may make it challenging for a practitioner, wishing to initiate narrow-band therapy, to choose the appropriate protocol. This article is a review of the literature on narrow-band UVB protocols and a guide to initiate therapy.

To commence therapy, a protocol that best suits the practitioner's expertise level and the type of staff the practitioner has is chosen. The two main types of narrow-band protocols presented in this review are the Skin Type and MED (minimal erythema dose) protocols. MED and skin type testing to determine the dose of narrow-band UVB to begin treatment are detailed in a step-by-step process. Subsequent treatment doses are based on the skin's response to the previous treatment.[11] Further adjustments in light dose can accommodate missed treatments. Narrow-band light treatments are continued until psoriasis clears or almost clears, followed by tapering maintenance treatments. The goals of therapy are to establish and maintain control over psoriatic flares, and to balance the risks and benefits of narrow-band treatment.

Narrow-band ultraviolet B (NB-UVB) was introduced in 1976 and has been widely used for psoriasis, especially in Europe and Australia. It became available in the United States in 1996. NB-UVB emits a wavelength between 311-313 nm, which is most phototherapeutic for the clearance of psoriasis. NB-UVB has been shown to be more effective than broad-band ultraviolet B (BB-UVB)[1,2,3] and almost as effective as PUVA for the treatment of psoriasis, but with a shorter remission time, and possibly with a lower risk of skin cancer.[4,5,6] No standardized protocol has yet been established for NB-UVB for psoriasis.

This is a review of the literature on NB-UVB protocols and aims to help dermatologists feel more comfortable initiating NB-UVB and employing an optimal and simple-to-use treatment schedule. Table 1 illustrates the two kinds of NB-UVB protocols found in the medical literature.

In deciding which protocol to use, each protocol has its strengths and limitations. The skin type protocol is easier to practice, and can be executed by a smaller staff and takes less time than the MED protocol. It is suitable for a busy, high-volume practice. However, it requires a more experienced staff to determine skin type and be able to accurately predict the skin's response to light. The MED protocol is more suitable for a less experienced staff because it specifically tests the skin's response to light. MED skin testing still requires some knowledge of skin typing, to gauge the correct range of light doses to use in MED skin testing, as illustrated in Table 4. However, the MED protocol requires a significant investment of staff time to perform MED testing, which may or may not be feasible in a very busy practice or by a small staff. After choosing the protocol, determine the skin type (Table 3) and/or the MED (Table 4), as appropriate to the protocol. Then initiate therapy as illustrated in Table 2.

Begin at the initial dose indicated in Table 2. Assess the response during the next treatment visit. The next light dose is dictated by the skin's response to the previous treatment, as illustrated in the "subsequent doses" row in Table 2.

Dose adjustment attempts to either maintain a barely perceptible erythema, which follows a more aggressive, erythmogenic strategy to therapy or, alternatively, it attempts to maintain just below a barely perceptible erythema, which follows a more con-

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Conflict of interest: none.

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Table 1: Description of the two types of NB-UVB protocols.

NB-UVB by Skin Type[7,8]	NB-UVB by MED[7,8]
Skin type is defined by the patient's history of response to sunlight through burning and/or tanning. This protocol requires that the treating practitioner be proficient in determining a patient's skin type and predicting how the skin will respond to light treatment. See Table 3: How to determine skin type. This protocol does not require MED skin testing.	MED (minimal erythema dose) is the minimal dose of NB-UVB light that causes a sharply-demarcated, uniform erythema, 24 hours after exposure, similar to a minimal/barely perceptible sunburn. This protocol requires skin testing to determine the patient's response to various doses of light, to determine the MED, and at which light dose to initiate therapy. Knowledge of skin typing is also required to do MED skin testing. See Table 3. To determine the MED, see Table 4: How to do MED skin testing.

Table 2: This illustrates the NB-UVB protocols, adopted and modified from the Leone Dermatology Center in the Chicago area.[7]

<table>
<tr><th></th><th>Skin Type NB-UVB Protocol
Adopted and modified from the Leone protocol.</th><th>MED NB-UVB Protocol
Adopted and modified from the Leone protocol.[7]</th></tr>
<tr><td>Initial Dose</td><td>Type I 130 mJ/cm^2
Type II 220 mJ/cm^2
Type III 260 mJ/cm^2
Type IV 330 mJ/cm^2
Type V 350 mJ/cm^2
Type VI 400 mJ/cm^2</td><td>Start with 70% MED*

* Authors report starting with 70% MED,[3,4,6,9,10,11,12] 60% MED,[2,7,8] or 50% MED.[1,13,14] Hofer et al found that starting at 70% MED is more effective than 35% MED.[15] The starting dose should be based on practitioner comfort and the patient's history of response to light. For example, start closer to 70% if the patient has a history of tanning; start closer to 50% if the patient has a history of burning. Most centers start treatment with 70% MED.</td></tr>
<tr><td>Subsequent Doses</td><td>Skin response: → Adjustment:
Severe erythema → No Tx. When burn resolves, 50% of last dose, then ↑ dose by ≤ 10%

Mild erythema → same dose
No erythema → ↑ dose by:
15 mJ/cm2 for Type I
25 mJ/cm2 for Type II
40 mJ/cm2 for Type III
45 mJ/cm2 for Type IV
60 mJ/cm2 for Type V
65 mJ/cm2 for Type VI</td><td>Skin response: Adjustment:
Severe erythema → No Tx. When burn resolves, 50% of last dose, then ↑ dose by ≤ 10%

Moderate erythema → ↓ dose by 20%

Barely perceptible erythema → same dose (erythmogenic strategy) or slight ↓ dose to just below the MED (suberythmogenic strategy)

No erythema → ↑ dose by 20%</td></tr>
<tr><td>Frequency of Tx[9,13,16]</td><td colspan="2">3 times weekly**
(Monday, Wednesday, Friday)

** Dawe et al have found no significant difference in clearing rates of psoriasis between five times weekly verses three times weekly to warrant the added inconvenience of more frequent treatments.[9] Similarly, Leenutaphong et al found no significant difference in efficacy and clearing rates of psoriasis between two times weekly verses a four times weekly NB-UVB treatments.[13] However, Cameron et al found that three times weekly NB-UVB cleared psoriasis significantly faster compared to two times weekly treatements.[16] Most treatment centers have adopted a three times weekly (TIW) regimen. Subsequent treatments are not to be given less than 24 hours from the last treatment.</td></tr>
<tr><td>Adjustment for Tx</td><td colspan="2">missed days: adjust dose:
1-7 days ↑ dose per skin type
8-11 days same dose
12-14 days ↓ by 2 Tx's worth
15-20 days ↓ by 25%
21-27 days ↓ by 50%
28+ days start over</td></tr>
</table>

servative, suberythmogenic strategy. For example, if the previous treatment did not cause erythema, the dose should be increased the next treatment. If the treatment caused a painless, barely perceptible erythema, the dose should be maintained for the erythmogenic approach or decreased very slightly for the suberythmogenic approach. If the previous treatment caused painful erythema/burning, the subsequent dose should be decreased or skipped entirely. The level of aggressiveness and how quickly a practitioner wishes to clear psoriasis dictates whether an erythmogenic or suberythmogenic approach is taken. Most treatment centers follow the suberythmogenic approach to therapy.[1]

Continue NB-UVB treatments three times weekly, as illustrated in Table 2. A Monday-Wednesday-Friday treatment schedule is typically used. Subsequent treatments are not to be given less than 24 hours from the last treatment. Continue treatments until the psoriasis is clear or almost clear. Typically, 30-35 treatments are required to clear psoriasis.[8] Take note of the last light dose used, which will be used during maintenance.

Sudden discontinuation of light treatment may result in relapse, so it is necessary to slowly taper down the frequency of treatment, while keeping the light dose the same. The goal of a tapering regimen is to minimize the chance of recurrence. The maintenance strategy is shown in Figure 1.

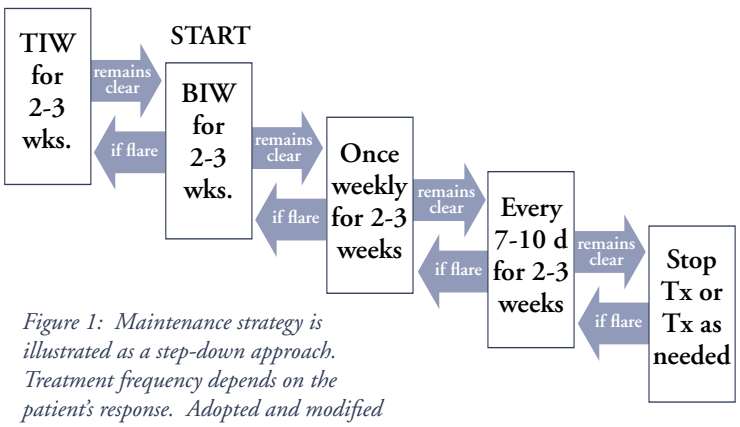


Figure 1: Maintenance strategy is illustrated as a step-down approach. Treatment frequency depends on the patient's response. Adopted and modified from Dermatology Nursing, *1997.*[17]

The UCSF Psoriasis and Skin Treatment Center & Phototherapy Unit prefers starting with twice weekly (BIW) versus once weekly maintenance, which offers a lower rate of recurrence, based on our clinical observation. Use the last light dose that the patient received during treatment. For example, as illustrated in Figure 1, start with BIW treatments for 2-3 weeks. If the patient remains clear, maintenance can be tapered to once weekly treatments. If the patient flares, increase the frequency to thrice weekly (TIW). The patient's response dictates how quickly maintenance therapy can be tapered and if maintenance can be safely discontinued.[17]

If patients have a history of severe flares or short remission, increase frequency and continue treatment as long as it takes to maintain clearance. It is not realistic to expect that all patients can discontinue NB-UVB by following this tapering strategy; some patients will need indefinite maintenance phototherapy at the lowest effective frequency. Patients with a history of stable psoriasis, mild flares or long remission may be controlled with less frequent treatments, then eventually discontinued.

These proposed protocols serve as a guideline to treatment and must be approached flexibly to accommodate the individual characteristics of each patient. Generally, more experienced physicians prefer to use more aggressive light dosing to maximize clearing of psoriasis, especially in patients with a known history of recalcitrant psoriasis resistant to other treatment modalities, even though the

Table 3: How to determine skin type

The purpose of skin typing is to quantitatively gauge the optimal light doses for an individual. Correct determination of skin type and prediction of the patient's response to light treatment are essential to optimal light treatment, to avoid burning or undertreating the patient.

Skin type is based on skin pigment and history of burning or tanning:

1. Pigment -
   Generally, the more skin pigment a patient has, the more protection he or she has against photodamage and burning. Darker-complected patients on average can tolerate higher doses of light, and lighter-complected patients usually cannot tolerate as much light, however, exceptions exist. Some darker-complected individuals burn at low levels of light, and some lighter-complected individuals do not burn at high levels of light.

   Skin type cannot be determined by pigment alone.

2. History -
   A patient's history of response to sunlight indicates how he or she will respond to light treatment, and how much light can be tolerated. A history of easy burning, regardless of pigment, indicates less tolerance to light than would be expected for that particular skin tone. For example, a patient who is deeply pigmented and presumably skin type VI, according to the chart below, who has a history of easy burning, may be categorized and treated as a skin type III or less.

patient's risk of burning may be increased. On the other hand, physicians who are overly conservative in their treatment strategy, fearful of burning patients, may deliver inadequate light doses, which prolongs the treatment course or results in treatment failure altogether. Optimal treatment of psoriasis with NB-UVB, like BB-UVB, is a delicate balance between the risk and benefit of optimally aggressive phototherapy dosimetry.

The following guidelines are adopted and modified from *Dermatol Nurs* 1996;8(4):235-241 and serve only as a rough estimate of skin type.

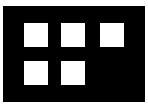
Skin Type	Response to sun	Tone
Type I	Always burns, never tans.	Very fair skin. Blonde, red, or light brown hair. Blue, green, or gray eyes.
Type II	Usually burns, sometimes tans.	Fair skin. Blonde, red, or brown hair. Blue, green, gray, or brown eyes.
Type III	Sometimes burns, usually tans.	Black or brown hair. Brown eyes.
Type IV	Minimally burns, tans well.	Light brown skin.
Type V	Very rarely burns, tans profusely.	Moderately pigmented, brown skin.
Type VI	Almost never burns.	Deeply pigmented.

Skin typing is an acquired skill that develops with practice and experience.

Table 4: How to do MED skin testing

1. Choose a body area that is usually shielded from the sun, like the buttock or lower back.

2. Use a 5-square photo-opaque cutout template (with a cutout area 1 cm^2 or 2 cm^2). The cutouts will receive increasing increments of NB-UVB light. Some studies use a 1 cm^2 area,[13,15] while other studies use a 2 cm^2 area.[14] The 2 cm^2 may offer easier visual assessment of the skin area.



3. Tape the template onto the skin and shield the surrounding skin from light exposure.

Skin Type	Incremental increase (in mJ/cm^2)	NB-UVB five-block doses (in mJ/cm^2) □	□	□	□	□
I	↑50	100	150	200	250	300
II	↑75	200	275	350	425	500
III	↑100	200	300	400	500	600
IV	↑100	300	400	500	600	700
V	↑125	300	425	550	675	800
VI	↑150	350	500	650	800	950

Adopted from the Leone Center MED testing for NB-UVB.[7]

4. The specific range of NB-UVB light used for MED testing depends on skin type. This decreases the risk of unnecessary burning and maximizes the chance of MED capture.

Expose all cutouts for the first light dose. Then shield each cutout when it has received its target light dose. For example, skin type III will start with all cutouts exposed to 200 mJ/cm^2 NB-UVB light. Then cutout #1 of the template is shielded because it has received its target of 200 mJ/cm^2. The remaining cutouts are given the incremental increase, of an additional 100 mJ/cm^2. Then cutout #2 is shielded, because it has received a cumulative dose of 300 mJ/cm^2, et cetera.

5. When all cutouts have received their target doses, mark the corners of the cutouts with a permanent marker before removing the template, so that the cutout areas can be located later.

6. Assess the area 24 hours after NB-UVB light exposure.

MED is the minimal NB-UVB dose that causes a sharply demarcated, uniform erythema, 24 hours after exposure, similar to a minimal sunburn. The cutout that causes this pattern is the MED.

It is possible that all cutouts may not have caused enough erythema or that all cutouts burned or appeared to have sharply-demarcated erythema. In this case, reassess the patient's skin type. The correct skin type is needed to determine the correct dose ranges for MED skin testing. After the patient has had a chance to recover completely from burning, reassess skin type and retest for the MED.

The MED is typically much higher for lower extremity areas below the knee compared to the trunk. For the most precisely optimized phototherapy, both MED of the trunk and the extremities can be tested, but this is often too cumbersome to perform.

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