NARROW BAND ULTRAVIOLET B (NB-UVB) "PHOTOTHERAPY" Review Of Literature (Part Two)

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Narrow Band UVB (311nm)
Review Of Literature:

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Introduction:

This review is started by a brief general introduction about photobiology. With review of almost all what was published about narrow band ultraviolet B (NB-UVB) in the medical literature in the past decade.

Reviewing the literature was done with the help of physician silver platter Dermatology medline that covers the period between 1966 and Dec.2000. we selected medline in our work because all internationally accepted journals and publications are almost included in this computerized facility.

Therapeutic trials :

NB-UVB significantly reduces natural killer(NK) cell activity in psoriasis vs PUVA and BB-UVB:

The numbers and function of circulating lymphocyte subsets are within normal ranges in patients with psoriasis and are not affected by 4 weeks of ultraviolet (UV) therapy, except for a suppression in natural killer (NK) cell activity. However, it is possible that immunomodulation might occur at the initiation of phototherapy with a return to control values on more prolonged UV exposure. Guckian et al studied the responses of 15 patients with chronic plaque psoriasis undergoing broad-band UVB therapy, 10 narrow-band (311-313 nm) UVB therapy and 10 PUVA therapy were compared. In each case, samples were taken immediately before starting treatment and 1 week later. Broad-band UVB and PUVA therapy had no effect on NK activity, but a significant reduction was found in the group receiving narrow-band UVB[32] .

Can Coconut Oil Accelerate Psoriasis Clearance In Narrow-Band UVB Phototherapy or Photochemotherapy?

Despite a widely held belief that the use of emollients prior to broad-band UVB irradiation accelerates clearance of psoriasis, only one single-blind controlled study exists in support of this.

No similar study has been carried out with photochemotherapy (PUVA) or narrow-band UVB (311-313 nm) phototherapy. As some emollients absorb UV radiation, and thereby inhibit psoriasis clearance, there is a need to identify emollients suitable for pre-irradiation use. Coconut oil may be useful in this respect.

In two randomized groups of patients with chronic plaque psoriasis undergoing either routine PUVA (n = 14) or narrow-band UVB phototherapy (n = 15), a single-blind controlled (half-body) study was undertaken to assess the effect of pre-irradiation application of coconut oil. Patients were given PUVA twice weekly, or TL-01 therapy thrice weekly. The initial UV dose was 70% of previously determined minimal phototoxic (MPD) or minimal erythema doses (MED), with 40% incremental steps at each visit (reduced if adverse effects occurred). Psoriasis severity was scored on each side after every three treatments. No significant acceleration of psoriasis clearance was seen in either group.

The author does not, therefore, recommend the routine use of emollients prior to PUVA or TL-01 therapy when using near erythemogenic irradiation regimens[33]

What Is The Effect Of NB UVB combined With Topical Therapy In Psoriasis On Induction Of Erythema And Systemic T-Cell Activation?

Psoriasis is a chronic T-cell-mediated inflammatory skin disease which can be treated with topical medication, phototherapy or systemic medication. A subgroup of psoriatic patients does not respond to monotherapy and needs combination therapy. De-Rie-MA et al used low-dose narrow-band UVB phototherapy, combined with: balneotherapy, short-contact anthralin, liquor carbonis detergens and calcipotriol for treatment of psoriatic patients in a day care centre.

The purpose was to study the efficacy, induction of erythema and effect on systemic T-cell activation of this combination therapy. Skin reflectance spectrophotometry was used to measure skin erythema. The Psoriasis Area and Severity Index (PASI) was used to evaluate psoriatic patients. Serum soluble IL-2 receptor (sIL2-R) levels were measured by an ELISA.

The possible erythematogenic effect of low-dose narrow-band UVB irradiation was studied (skin reflectance spectrophotometer) in a control group of psoriatic patients, and No induction of skin erythema was seen.

Subsequently, this low-dose irradiation regimen was used in combination with topical medication in 26 psoriatic patients.

A 90% decrease in the PASI was seen after a mean number of 35 treatment sessions. Seventeen patients (65%) remained in remission during the following 6 months. Serum sIL-2R levels were elevated in all patients (mean 913 U/ml) and did not change during treatment.

The conclusion was that low-dose NB-UVB can be used successfully, in combination with topical treatment, in a day care setting to treat psoriatic patients. Since sIL-2R serum levels were not decreased, it can be speculated that this treatment does not induce systemic immunosuppression[34] .

NB UVB Antimicrobial Effect:

Narrow-band UVB lamp at a wavelength of 313 nm and a UVA1 lamp at a wavelength of 345-440 nm. These two new UV lamps were investigated with respect to their antibacterial effectiveness in vitro. Propioni (n = 20 strains) and Micrococcaceae (n = 16 strains) bacteria extracted from acne patients were applied to RCM and sheep blood agar plates and irradiated with a narrow-band UVB lamp and a UVA1 lamp. The precisely defined energy levels were, in the case of narrow-band UVB, 0.00, 0.30, 0.50, 1.00, 2.00 and 3.00 J/cm2 and, in the case of UVA1, 0.00, 2.50, 5.00, 7.50, 10.00 and 20.00 J/cm2. UVA1 inhibited neither the growth of Propioni nor Micrococcaceae bacteria.

In contrast, the growth of Micrococcaceae was inhibited already at a dosage of 0.30 J/cm2 of narrow-band UVB ($P < 0.05$), highly significant from 0.50 J/cm2 ($P < 0.01$) and to a maximum of 2.2 powers of 10 at 3.00 J/cm2 compared with non-radiated control plates. Propioni bacteria were significantly inhibited at the minimum dosage of 0.30 J/cm2 of narrow-band UVB ($P < 0.01$) and to a maximum of 2.8 powers of 10 at 3.00 J/cm2 [35].

Sequential Combined Therapy With Thalidomide And Narrow-Band (TL01) UVB In The Treatment Of Prurigo Nodularis.

Prurigo nodularis (PN) is a chronic disease of which treatment choices are limited. Among them, thalidomide and phototherapy have been used with satisfactory results. Unfortunately, the possibility of side effects limits their use. To evaluate the efficacy of a sequential combined treatment with thalidomide and ultraviolet B (UVB) therapy in order to minimize side effects and, thus, making possible a long-term treatment. A prospective open trial combining thalidomide as initial therapy followed by narrow-band UVB (TL01) irradiation until complete or almost complete remission of the disease was achieved.

An excellent response was obtained after an average of 12 weeks of thalidomide therapy and 32 UVB

courses. *Sequential combined therapy with thalidomide and narrow-band UVB therapy could improve the management of prurigo nodularis with minimal side effects*, although it should probably be reserved to men and women over 50 years of age[36].

The Relation Between Phototherapy And Urocanic Acid Isomers And Natural Killer Cell Function?

Ultraviolet (UV) radiation suppresses a variety of immune responses but it is uncertain whether this action contributes to the effectiveness of phototherapy. Urocanic acid (UCA) has been proposed as a mediator of the immunologic effects of UV. On exposure the naturally occurring trans-isomer of UCA in the skin changes into the cis-isomer, which has been demonstrated to mimic many of the immunomodulatory effects of UV irradiation. Natural killer (NK) cells play an important role in several immunologic processes and published evidence indicates that their activity is altered by UV irradiation. To ascertain the effect on NK cells of phototherapy used in the treatment of psoriasis, modulation of NK activity in psoriatic patients undergoing BB-UVB, NB-UVB, or psoralen plus (PUVA) regimens was examined. This was compared with NK cell activity in psoriatic patients treated with topical coal tar and in normal subjects receiving broad band UVB. The NK cell activity of psoriatic and normal subjects was the same over a wide range of effector to target cell ratios. Almost all patients undergoing phototherapy exhibited depressed NK cell activity during or after irradiation, although the timing of the depression varied between the lamps used and may be related to dose. However, patients treated with topical coal tar showed unchanged NK cell activity throughout the therapy. The effect of UCA isomers on NK cell activity in vitro was also determined.

It was found that cis-UCA induced a dose-dependent suppression of NK cell activity in both patients and normal subjects, Whereas trans-UCA had hardly any effect in either group. Thus it is possible that there may be a correlation between cis-UCA formation in the epidermis and the modulation of NK cell activity that occurs during phototherapy[37].

The Effects Of UVB Plus Calcipotriol On Systemic Calcium Homeostasis In Patients With Chronic Plaque Psoriasis.

Bourke et al studied the effects of combining topical calcipotriol, used at the maximal licensed dose, and narrow-band short wave ultraviolet light (TL01) on systemic calcium homeostasis in the treatment of chronic plaque psoriasis. Patients were randomized in an open fashion to receive either UVB alone, UVB plus 100 g of calcipotriol (50 micrograms/g) ointment per week or calcipotriol ointment alone (100 g/week). With the exception of a slight increase in serum phosphate in the group receiving combination therapy, no differences were observed between or within the groups. Psoriasis area and severity scores (PASI) improved to a greater extent in those patients receiving both UVB and calcipotriol. The combination of UVB and calcipotriol is a safe, effective treatment for chronic plaque psoriasis[38].

Photosensitizing Drugs May Lower The Narrow-Band Ultraviolet B (TL-01) Minimal Erythema Dose(34):

In Feb 2000 Cameron-H suggested that photosensitizing drugs may lower the narrow-band ultraviolet B (TL-01) minimal erythema dose in a corresponding letter. His suggestion worth trying and further investigations [39].

Comparative studies :

Comparison of narrow-band TL-01 phototherapy and PUVA photochemotherapy for psoriasis:

PUVA treatment of psoriasis is more effective than conventional or broad-band UVB phototherapy. Two small studies have suggested that narrow-band or TL-01 phototherapy may have a therapeutic effect equal to PUVA. If confirmed, this would be of considerable importance as TL-01 therapy is likely to be considerably safer in the long term than PUVA.

Gordon studied 100 patients with plaque-type psoriasis who were randomly allocated to twice-weekly treatment with PUVA or narrow-band UVB.

His study showed that clearance of psoriasis was achieved in a significantly greater proportion of patients treated with PUVA (84%) than with TL-01 (63%) (P =.018), and with significantly fewer treatments (median number of treatments for clearance with PUVA, 16.7; with TL-01, 25.3; P=.001). Only 12% of those treated with TL-01 were clear of psoriasis 6 months after finishing treatment compared with 35% for PUVA (P=.002). He concluded that when given twice weekly, PUVA is more effective for psoriasis than narrow-band UVB phototherapy[40].

Comment: It is possible that if NB -UVB was used more frequently, 3- 4 times a week, this might be more effective or gives better results.

Comparing Psoralen NB UVB vs Psoralen UVA (PUVA) in psoriasis:

De-Berker et al studied 100 patients with plaque-type psoriasis who were randomly selected to receive either conventional psoralen-UVA or psoralen-NB UVB treatment. There was no significant difference between the two treatments in the proportion of patients whose skin cleared during treatment or in the number of exposures required for clearance of psoriasis. As expected, the cumulative UV dose for clearance was smaller in the group treated with UVB compared with those receiving UVA.

Side effects and disease status at 3 months after the end of treatment were similar for the two groups.

The mechanism of psoralen-311 nm UVB action on psoriasis requires study to predict the long-term safety of this treatment. The conclusion was that Psoralen-NB UVB treatment of psoriasis is as effective as conventional PUVA[41].

Comparing Psoralen NB UVB vs NB UVB in psoriasis:

Narrow-band UVB exposure after oral methoxsalen has been shown to achieve a greater therapeutic response in psoriasis than identical UVB exposure given without psoralen[41].

Comparison Of NB UVB vs BB UVB In Treatment Of Psoriasis Vulgaris:

Suberythemogenic narrow-band UVB is markedly more effective than conventional UVB in treatment of psoriasis vulgaris.

Narrow-band UVB (NB-UVB) is a new phototherapy option for psoriasis. Action spectrum studies previously done with different UVB wavelengths suggest that suberythemogenic doses of NB-UVB could be highly effective in treating psoriasis vulgaris. Even so, no comparative studies with suberythemogenic doses of NB versus conventional UVB have been performed previously. The purpose of Walters study in 1999 was to compare conventional broad-band UVB (BB-UVB) with (NB-UVB) at suberythemogenic doses for the treatment of psoriasis vulgaris. Eleven patients were treated using a split-body approach for 6 weeks on a three-times-a-week basis. Outcomes were evaluated by means of Psoriasis Severity Index scores and quantitative histologic measures. There were clinical clearing in 81.8% of patients after NB-UVB, but in only 9.1% of patients after BB-UVB ($P < .01$). Biopsy specimens obtained at the end of treatment revealed that keratin 16 staining was absent in 75% of patients on the NB side compared with none on the BB side, suggesting a reversal of regenerative epidermal hyperplasia by NB-UVB. Walter concluded that NB-UVB is superior to BB-UVB in reversing psoriasis at suberythemogenic doses when given three times per week. And his schedule was well tolerated by all patients[42].

Earlier in 1992 Picot et al in a left-right comparative study, He evaluated the Philips TL-01 sunlamp, in 15 patients with symmetrical psoriasis. One half of the body was treated in a cabin containing TL-01 lamps, and the other half in a cabin containing TL-12 lamps. The patients were treated three times/week, and the study was conducted in a randomized, double-blind fashion. The percentage response of psoriatic lesions was determined on the tenth and twentieth exposures.

The therapeutic effect of the TL-01 lamps was superior to that of the TL-12 lamps, and treatment was better tolerated, particularly with regard to episodes of burning. The conclusion was that TL-01 lamps was superior to that of the TL-12 lamps and appears to provide more effective and safer phototherapy for psoriasis[43].

Also Storbeck et al in 1993 proved in 20 of 23 cases that NB UVB (TL 01) lamp is significantly more effective than the conventional BB UVB source[44].

Comparing a high and a low incremental NB UVB dose regimen in tratment of psoriasis:

Narrowband (311-313 nm) ultraviolet B phototherapy with the Philips TL-01 lamp is used increasingly in the treatment of psoriasis with little information available on the optimum irradiation regimen. Wainwright in 1998 compared a high and a low incremental dose regimen in 20 patients with symmetrical chronic plaque psoriasis using a randomized half body study and thrice weekly exposures. Paired trunk, leg and arm plaques of psoriasis were scored blind prior to and at each treatment for scaling, erythema and induration. Patients were treated to clearance or minimal residual activity and followed up until relapse. The low increment regimen achieved a 10% reduction in the median cumulative dose to clearance (16,401 vs. 18,246 mJ/cm2) with one extra treatment in 50% of the patients. However, the duration of

treatment (median 53.5 days) was identical for both regimens except for one patient because there were 50% fewer episodes of erythema requiring postponement of treatment with the low increment regimen. *The author favours the low increment regimen for phototherapy in his psoriasis population*[45].

Comparison of narrow-band (311 nm) UVB and broad-band UVA after oral or bath-water 8-methoxypsoralen in the treatment of psoriasis.

There is a disparity between the absorption spectrum of 8-methoxypsoralen and the action spectrum for psoralen-sensitized erythema. In an action spectrum corrected for unsensitized reaction 313 and 365 nm have similar efficacies.

Ortel et al evaluated the relative erythemogenic and antipsoriatic efficacy of narrow-band (311 nm) UVB with and without prior psoralen exposure. He also compared the effects of narrow-band UVB and broad-band UVA after oral and bath-water psoralen exposure.

Patients with psoriasis underwent half-side comparison studies.

1- In one group the therapeutic efficacy of 311 nm UVB with and without oral psoralen was assessed.
2- The second group received UVA and 311 nm UVB after oral psoralen.
3- The third group was exposed to both radiation sources after bath-water exposure.

Results:

1- The erythemogenic, pigmentogenic, and therapeutic efficacy of 311 nm were increased by oral psoralen.
2- With systemic 8-methoxypsoralen, UVA was comparable to 311 nm UVB.
3- After bath-water exposure, 311 nm was clearly superior to broad-band UVA.

He concluded that the efficacy of narrow-band 311 nm UVB can be enhanced by psoralen and that Narrow-band 311 nm UVB is also effective after psoralen bath-water delivery[46].

Comparison of NB UVB vs anthralin with and without (NB-UVB) in treatment of psoriasis

Storbeck et al tried Narrow-band UVB (311 nm) versus conventional broad-band UVB with and without dithranol in phototherapy for psoriasis.

In 13 patients dithranol in a modified Ingram regimen was added. In most cases the study was discontinued once a difference between the two sides was evident. He concluded that the Application of dithranol provided a substantial additional therapeutic effect[44].

Comparison of phototherapy with near vs. far erythemogenic doses of (NB UVB) in patients with psoriasis.

The therapeutic effectiveness of radiation from a 311 nm ultraviolet B (UVB) lamp (Philips TL-01) in a near vs. far erythemogenic therapy regimen was investigated in 13 patients with widespread, symmetrically distributed psoriasis. The patients received UV therapy starting with 70% of the 311 nm minimal erythema dose (MED) on one randomly chosen half of the body and 35% of the 311 nm MED on the other half. Therapy was given three to five times a week, and the UVB dose in both regimens was increased simultaneously in the same relation. *Results suggest that near erythemogenic 311 nm UVB therapy may clear psoriasis faster than far erythemogenic therapy* but that the latter regimen may be equally effective as it requires slightly more treatment sessions at a lower (and possibly less carcinogenic) cumulative UV dose[47].

Comparison Of NB UVB Three Times vs Five Times Weekly In The Treatment Of Psoriasis:

Three and five times weekly narrow-band TL-01 (311-313 nm) ultraviolet (UV) B phototherapy regimens for chronic plaque psoriasis were compared by Dawe-RS in a randomized, observer-blinded, half-body, within-patient paired study. Twenty-one patients entered the study. Sixteen reached clearance or minimal residual activity (MRA) on both sides. Of the other five, three withdrew because they did not reach clearance or MRA on the 5x weekly side by a maximum of 30 treatments, one when he was satisfied with moderate improvement and one because of repeated failure to attend. Those who completed treatment reached clearance or MRA after a median of 35 days with 5x weekly treatment compared with 40 days with 3x weekly treatment ($P = 0.007$), but required a median of 23.5 compared with 17 UVB exposures ($P = 0.001$) and 94 minimal erythema dose multiples (MEDs) compared with 64 MEDs ($P = 0.01$). Fifteen (of 16) developed at least one episode of well-demarcated erythema during 5x weekly treatment compared with just three of 16 treated 3x weekly ($P < 0.001$).

There was no significant difference between regi-

mens in duration of remission.

For this skin phototype I-III population, the more rapid clearance of psoriasis with 5x weekly phototherapy is not, for the majority of patients, sufficient to justify the extra exposures and higher UVB dose.

The author no longer use 5x weekly phototherapy for psoriasis[48].

Comparison Of The Efficacy And Relapse Rates Of Narrow Band UVB (TL-01) Monotherapy Vs. Etretinate (RE-TL-01) Vs. Etretinate-PUVA (RE-PUVA) In The Treatment Of Psoriasis Patients.

Forty-five patients with extensive chronic plaque or guttate psoriasis were treated with either narrowband (TL-01) phototherapy, etretinate TL-01 combination therapy (re-TL-01) or etretinate and PUVA (re-PUVA) (15 patients in each group).

Re-PUVA was the most effective therapy with 100% satisfactory clearance rate.

In the etretinate-TL-01 group, there was a 93% success rate and a one-third reduction in the total irradiation dose (8.0 J/cm2 vs. 12.7 J/cm2) but the relapse rate was higher, only 33% remaining in remission after 6 months.

TL-01 monotherapy had an 80% success rate; the relapse rate compared favourably with re-PUVA (50% in remission after 6 months) [49].

Comparison of NB UVB radiation vs topical PUVA in the Treatment of Vitiligo:

To compare the efficacy and safety of two treatment modalities, topical psoralen plus UV-A (PUVA) with unsubstituted psoralen and 311-nm UV-B radiation, in patients with vitiligo. This intervention study was designed as a before-and-after trial with 2 arms, in which patients were consecutively included. Male (n = 99) and female (n = 182) patients, who predominantly had skin type III, with extensive, generalized vitiligo of more than 3 months' duration. Two patient groups were investigated. The first group of patients was treated for 4 months with either topical PUVA (n = 28) or 311-nm UV-B radiation (n = 78). The second group of patients, treated twice weekly with 311-nm UV-B radiation, was followed up for 3 (n = 60), 6 (n = 27), 9 (n = 37), or 12 months (n = 51).

Thirteen (46%) patients in the first group treated with topical PUVA showed repigmentation after 4 months. Fifty-two patients (67%) in the 311-nm UV-B treatment group showed repigmentation after 4 onths.After 3 months, 5 patients (8%) in the second group showed more than 75% repigmentation of lesional skin compared with 32 patients (63%) after 12 months. As in other treatment modalities, the face showed good repigmentation, whereas hands and feet responded poorly.

No adverse effects were encountered with treatment with narrowband UV-B radiation, contrary to those seen with topical PUVA treatment. The cumulative UV-B dose was very small compared with that of the topical PUVA treatment.

It was concluded that the treatment of patients with vitiligo with 311-nm UV-B radiation is as efficient as with topical PUVA [50].

Comparison of NB UVB radiation vs. PUVA in the Treatment of PME:

Twenty-five patients suffering from severe polymorphic light eruption (PLE) were randomized to either photochemotherapy (PUVA) or narrow-band phototherapy (TL-01 UVB) treatment in early spring; patients receiving UVB were given placebo tablets to achieve a matching therapy procedure. During the 4 months following treatment, patient exposure to solar UVB was monitored with polysulphone badges. PLE occurrence, severity, and restriction of outdoor activity were recorded, using weekly diary-sheets. Analysis of covariance on this data, using the logarithm of UVB exposure as the explanatory variable, showed no significant differences between the treatments. TL-01 UVB is an effective alternative to PUVA in the management of PLE[51].

Combination therapy with NB UVB :

Combination Of Narrow band UVB (311 nm) Phototherapy And Bath PUVA Photochemotherapy in treatment of psoriasis:

Psoralen-UVA (PUVA) photochemotherapy is widely used for the treatment of psoriasis despite concerns of skin carcinogenesis from high cumulative UVA doses and number of treatments.

Calzavara et al attempted to determine whether combined bath-PUVA with narrow-band (311 nm) phototherapy improves efficacy and reduces long-term toxicity. Twelve psoriatic patients underwent phototesting with 311 nm lamps and, after topical bath-water psoralen sensitization, with 311 nm, UVA, or both radiations. Patients were treated with bath-PUVA on one side of the body and with bath-PUVA plus 311 nm exposures

(bath-PUVA-311 nm) on the other side. On both sides, four weekly treatments were delivered and UVA doses were increased once weekly whereas 311 nm doses were adjusted at each exposure.

Psoralen sensitization did not modify the erythematous threshold to 311 nm radiation. However, 311 nm exposures enhanced the phototoxic activity of bath-PUVA. Bath-PUVA-311 nm cleared psoriasis with fewer exposures and lower cumulative UVA doses under the same minimally erythemogenic conditions.

He concluded that Combination with 311 nm exposures enhanced the phototoxic and therapeutic activities of bath-PUVA[52].

Combination Of PUVA and NB-UVB:

Combination with 311 nm exposures enhanced the phototoxic and therapeutic activities of bath-PUVA[53].

Combination Of NB-UVB (311 nm) with dithranol in psoriasis.

For UVB, the most effective wavelength in clearing psoriatic lesions was found to be of 313 nm.

The efficacy of whole body exposure to narrow-band UVB (311 nm) combined with dithranol in psoriasis has not been evaluated to date.

Carrozza Evaluated the clinical efficacy of phototherapy with narrow-band UVB (311 nm) and dithranol for psoriasis by means of whole body exposures and analysis of the mean cumulative irradiation dose. In his open pilot study, 13 patients were treated for 4-5 weeks. Evaluation of the therapeutic efficacy was performed by comparing the Psoriasis Area and Severity Index (PASI) scores at baseline and after 4 weeks of treatment. The cumulative irradiation dose was also calculated. Evaluation of the PASI scores showed a significant overall reduction of psoriatic lesions after 4 weeks of treatment. The cumulative irradiation dose was similar or lower to those found for phototherapy with narrow-band UVB alone.

He concluded that in wide spread psoriasis, treatment with narrow-band UVB (311 nm) combined with dithranol is safe and effective, allowing reduction of the cumulative irradiation dose[54].

Combination Of Calcipotriol Ointment And Low-Dose NB- UVB Phototherapy In Psoriasis.

Brands et al found that low-dose narrow-band UVB phototherapy is effective in the treatment of psoriasis, and Calcipotriol ointment does not improve the treatment outcome with low-dose narrow-band UVB phototherapy[55].

Earlier and in 1997 Bourke-JF showed that The combination of UVB and calcipotriol is a safe, effective treatment for chronic plaque psoriasis[38] .

Comment:

The direct application of any opaque material prior to ultraviolet exposure may block its effect. This includes calcipotriol, salisylic acid and other materials including vasline. But the application of these materials on the other half of the day or washing them prior to exposure to ultraviolet will not block its effect but this may give additional effect according to the used substance.

While Molin-L found a beneficial effect of combining calcipotriol and phototherapy. His findings are comparable to other published studies[56].

Also Calcipotriol cream + twice weekly broad-band UVB phototherapy is an effective and safe antipsoriatic treatment, resulting in fewer UVB exposures, lower cumulative irradiance and a saving of time[57].

Combination Phototherapy Of Psoriasis With Narrow-Band UVB Irradiation And Topical Tazarotene Gel:

Tazarotene has been shown to be efficacious in plaque-type psoriasis. Combination of narrow-band UVB with topical agents has been shown to enhance efficacy of both treatment modalities.

Behrens evaluated the efficacy of narrow-band UVB phototherapy in combination with topical tazarotene 0.05% on ten patients with stable plaque psoriasis. .Topical tazarotene 0.05% was applied once daily to one side of the body. The follow-up period was 4 weeks.

Efficacy was assessed separately for both body halves by means of a modified Psoriasis Area and Severity Index (PASI). Both treatment modalities notably reduced the PASI scores with values being significantly lower in skin areas treated with narrow-band UVB phototherapy in combination with topical tazarotene.

He conclued that the addition of tazarotene to narrow-band UVB phototherapy promotes more effective, faster clearing of psoriasis compared with UVB (311 nm) monotherapy[58].

Guenther-L studied the efficacy of other combination with tazarotene gel in the treatments of psoriasis including topical

steroids, calcipotriene BB-UVB and NB-UVB phototherapy, and psoralens plus UVA bath therapy. In the hope of increasing efficacy and improving safety.

A number of large-scale studies have shown that the adjunctive use of a mid-potency or high-potency steroid can enhance both the efficacy and tolerability of tazarotene treatment. A small pilot study also suggested improved efficacy when used in combination with calcipotriene. Likewise, the adjunctive use of *tazarotene can enhance the efficacy and potentially the safety of treatment with steroids, broad-band and narrow-band UVB phototherapy, and psoralens plus UVA bath therapy*[59].

UVB or UVA Phototherapy And Tazarotene:

Tazarotene remained chemically stable when used in conjunction with UVB or UVA phototherapy. To reduce the patient's potential to burn or tan, Hecker-D recommend initiating UVB phototherapy at 50% to 75% of the MED when it is used in combination with tazarotene. He also recommend initiating PUVA therapy at slightly lower doses than usual. Lower total doses of UVA or UVB may be needed when patients with psoriasis are treated concomitantly with tazarotene[60].

Conclusion Of The Review Of NB-UVB:

* Narrow Band UVB wave length is 311 nm.
* Narrow band UVB virtually eliminates superfluous and harmful UV by emitting only wavelengths of 311-312 nm.
* NB UVB causes reduction of CD1a, increase of HLA-DR, and induction of E-selectin in normal skin
* Indications are almost those of BB-UVB and PUVA such as psoriasis , atopic dermatitis, vitiligo, porphyria and photodermatosis and others.
* Narrow-band, or TL-01, or 311 nm phototherapy has a higher ratio of therapeutic to erythemogenic activity, resulting in :1-increased efficacy. 2-reduced incidence of burning. 3-longer remissions in psoriasis.
* NB UVB may cause characteristic lesional blistering
* The increased Carcinogenicity is Controversy in NB UVB
* NB UVB with topical therapy in psoriasis does not inhibit systemic T-cell activation?
* NB UVB has antimicrobial effect?
* NB UVB transfer tran UCA into sis UCA which suppresses NK cells
* NB UVB is more effective than BB UVB
* psoralen NB UVB is more effective than NB UVB
* Psoralen-UVB treatment of psoriasis is as effective as conventional PUVA.
* NB UVB enhances the phototoxic and therapeutic activities of bath-PUVA
* NB UVB& anthralin is more effective than BB UVB, anthralin?
* B3 is as effective as B5?
* Results suggest that near erythemogenic 311 nm UVB therapy may clear psoriasis faster than far erythemogenic therapy.
* Both bath-PUVA versus NB-UVB regimens appear to be equally effective in tratment of atopic dermatitis when administered in equi-erythemogenic doses.
* Narrow-Band UVB is effective in treatment of generalized vitiligo in children and adults, small Plaque Parapsoriasis and Early-Stage Mycosis Fungoides, some photodermatosis
* NB-UVB has a lot of advantages combared to that BB-UVB or PUVA
* NB UVB Increases The Effects Of Other Topical And Systemic Anti Psoriatic Therapies

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