

Original Article

Factors influencing the response to narrow band ultra violet-B therapy among patients with chronic plaque psoriasis

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Abstract

Introduction

Narrow band ultra violet-B (NBUVB) phototherapy is an effective and safe mode of therapy for chronic plaque psoriasis. However the degree of action has been shown to vary with various factors such as age, extent of the lesions, tolerance of NBUVB and duration of the illness

Objective

This study aimed at describing factors influencing the response to NBUVB among patients with chronic plaque psoriasis treated at the District General Hospital (DGH), Matara.

Method

A descriptive study carried out at the Dermatology Unit, DGH, Matara, among a convenient sample of patients with chronic plaque psoriasis who received NBUVB during a period of one and half years. The response to NBUVB was calculated as the difference between the initial and the post treatment psoriasis area severity index (PASI) scores as a percentage of the initial score. Age, initial PASI score, cumulative dose, erythema response and disease duration were assessed for their influence on the response to NBUVB using multiple regression analysis.

Results

A total of 63 patients were included and 46% were between 41-60 years of age. The study results showed that 36(57%) patients had 75-89% (PASI-75) reduction in the post treatment PASI, indicating that they had 75-89% clearance of skin lesions following the NBUVB treatment. Age, initial PASI score, cumulative dose and maximum erythema response dose did not show a significant correlation with the response rate. Only the duration of the illness had a significant moderate correlation with response rate (standardized coefficient (beta) = -0.476, p = 0.01).

Conclusion

Efficacy of the NBUVB therapy is high if the duration of the illness is shorter. Therefore, NBUVB needs to be considered as a treatment option early in the disease.

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Introduction

Psoriasis is a chronic, relapsing, inflammatory skin disorder with thickened epidermis, with expanded dermal vascular compartment, as well as infiltrate of neutrophils and lymphocytes. Phototherapy using narrow band ultra violet B (NBUVB) rays has been a treatment modality in chronic skin disease from early in the last century. NBUVB, through its effects on T cells, suppresses the signaling pathway in keratinocytes and Langerhans cells [1] thus suppressing the excessive immune response responsible for the inflammation. The two main phototherapeutic treatment modalities currently in use for treatment of psoriasis are NBUVB and photo-chemotherapy using psorelene and ultraviolet-A (PUVA) [2, 3]. However response to phototherapy has been shown to vary among patients based on factors such as age, extent of the lesions, tolerance of the NBUVB and duration of the illness.

In the past, with the advent of biological agents for the treatment of psoriasis, there was a decline in the use of phototherapy [4]. However, currently, there is renewed research interest in phototherapy,

as use of biological agents as mono-therapy long term has been associated with inadequate response and side effects [5, 6]. This study is aimed at describing the factors influencing the response to NB-UVB among patients with chronic plaque psoriasis treated at the District General Hospital (DGH), Matara.

NB-UVB therapy has been available at the Dermatology Unit, DGH, Matara since 2012. Although it is new to DGH Matara, phototherapy with ultraviolet-A (UVA) has been used in developed countries since 1982 and has been available in Sri Lanka since 2000. The observation of different degrees of responses among chronic plaque psoriasis patients undergoing NB-UVB treatment at DGH Matara prompted this study.

Methods

This was a descriptive study conducted at the Dermatology Unit of the DGH, Matara, Sri Lanka, in a convenient sample of patients with chronic plaque psoriasis who received NB-UVB during a period of one and half years commencing 20.11.2012. The inclusion criteria were the same criteria that made them eligible to receive NB-UVB treatment i.e. chronic plaque psoriasis patients above 12 years of age not responding to conventional oral medication, potent corticosteroid local application (Clobetasol propionate 0.05%, Betamethasone valerate 0.1%), patients with life style disability [7, 8] and patients with more than 10% of the body surface area affected. Patients with acute inflammatory conditions, those who were severely ill, those with a history of failed phototherapy or previous arsenic or ionizing radiation exposure or with a history of melanoma, epithelial malignancy, bullous disease, cataract, severe cardiovascular, hepatic or renal disease or immune suppression and patients who were pregnant were not offered NB-UVB. Eligible patients were invited to participate in the study, prior to the commencement of treatment by providing them with information regarding the study and obtaining written consent. Ethical approval for the study was obtained from Ethical Review Committee of National Institute of Health services of Sri Lanka on 1st of October 2012. General information and the clinical history of the selected study units were recorded prior to the commencement of treatment.

The psoriasis area severity index (PASI) was used to calculate the severity score according to body involvement [9]. As recommended by the PASI four affected sites [head (h), upper limb (u), trunk (t) and lower limb (l)] were scored separately, using three parameters; erythema (E), induration (I) and desquamation, (D), each of which was graded on a severity scale of 0-4, where 0=nil, 1=mild, 2=moderate, 3=severe and 4=very severe. The area wise percentage involvement of the involved site (A) was calculated as 1=<10% area, 2=10-29%, 3=30-49%, 4=50-69%, 5=70-89% and 6=>90%.

The index was calculated using the formula; $PASI = 0.1(E_h + I_h + D_h) A_h + 0.2(E_u + I_u + D_u) A_u + 0.3(E_t + I_t + D_t) A_t + 0.4(E_l + I_l + D_l) A_l$. Daavlin clinical phototherapy device- UV series (USA make) was used to treat patients in this study. Dose and duration were calculated according to the dosimeter chart provided by the manufacturer of the ultra violet cabinet. Since this is an automated machine the duration of therapy is calculated automatically when the dose is entered into the computer. Initial therapy may be started with the minimum erythema dose (MED) or with the recommended lowest dose according to the Fitzpatrick classification of skin type where Asian skin is typed as IV or V. The Fitzpatrick classification of skin type indicate that Type I as pale white skin; always burns, never tans; Type II as white fair skin; usually burns, tans minimally; Type III as cream white skin; sometimes mild burn, tans uniformly; Type IV as moderate brown skin; burns, always tans well; Type V as Dark brown skin; Very rarely burns, tans very easily and Type VI as Deeply pigmented dark brown to darkest brown skin; Never burns, never tans. According to this classification Asian skins fall into categories of type IV and V. In this study three initial doses were selected according to the color of the skin (160, 260 and 360 mJ/cm²). Dose increments were done in a stepwise manner until the maximum erythema response was reached. This method was adopted from the "Phototherapy, related topics and dermatological day care" Manual of the National Skin Center, Singapore [10]. The second dose was increased by 100% and subsequent doses were increased by 50%, 40%, 30%, 20%, 19%, 18%, 17%, 16% and 15% respectively. Phototherapy was given three times a week up to 20-25 sessions. Maximum dose was determined by the development of erythema following treatment. Following determination of the maximum dose, a dose one step below the maximum dose was used for

continued treatment in order to improve tolerability. In between NB-UVB therapy patients were treated with coconut oil compound, 10% cetrimide shampoo, 1% hydrocortisone cream, to the head and face and aqueous cream and 50% white soft paraffin: 50% liquid paraffin to the body and limbs. In addition chlorpheniramine, promethazine, famotidine and omeprazole were used where necessary. Results of investigations, other treatment, side effects and the cumulative dose of the NBUVB were recorded in a standard form.

The response of the patients to NB-UVB was calculated as the difference between the initial and the post treatment PASI scores as a percentage of the initial score (response rate = initial PASI Score- PASI score after treatment / initial PASI score X100). Age, initial PASI score, maximum erythema dose, cumulative dose and the duration of illness were assessed for their influence on the response to NBUVB using multiple regression analysis.

Results

Eighty five patients were recruited for the study but only 63 patients who completed treatment (74%) were analyzed. When patients with missing data were excluded data of patients giving a response rate of the study units, 50 (79%) were male and 13(21%) were female. Analysis of age groups revealed that two individuals (3%) were below 20 years of age, 9 (14%) were 21- 40 years, 29 (46%) were 41-60 years and 23(37%) were 61- 80 years.

The mean age of the patients was 53 (SD \pm 14.9). The initial treatment PASI score was between 6.4 and 50.8. Twenty three (37%) had PASI below 20, 29 (46%) had PASI between 21-40 and 11 (17%) had PASI above 41 in this.

The cumulative dose of NBUVB used on the patients in the study is shown in Table1 and varies between 8863 to 95930 mJ/cm² with a mean of 37465 mJ/cm² (SD \pm 22827).

Table1. Distribution of the study population by cumulative dose used in the NBUVB treatment

Cumulative dose in mJ/cm ²	Number (%)
Low dose <34000	39(62)
Moderate dose 34000-70000	15(24)
High dose >70000	9(14)
Total	63(100)

The energy levels that led to the development of erythema were shown to be between 1200 mJ/cm² to 5000 mJ/cm² with a mean of 2925(SD \pm 1256).

Table 2. Distribution of study population by energy levels that led to development of erythema

Energy in mJ/cm ²	Number (%)
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Low dose <2000	24(38)
Moderate dose 2000-4000	27(43)
High dose >4000	12(19)
Total	63(100)

Response rate to NB-UVB was assessed based on the difference of the initial and the post treatment PASI scores as a percentage of initial score. Thirty six (57%) patients had 75-89% (PASI-75) reduction in the post treatment PASI. This indicated 75-89% clearance of the skin lesions following the treatment.

None of the patients had more than 90% (PASI-90) reduction of the disease following the therapy.

Table 3: Distribution of the study population by the response rates to the of NBUVB treatment.

Response rate	Number (%)
75-89% (PASI-75)	36 (57)
50-75% (PASI-50)	16 (25)
Less than 50%	11 (18)
Total	63(100)

Side effects of pruritus, hyperpigmentation over the lesions, xerosis and erythema were seen in 40 (53%), 36 (48%), 35 (46%) and 33(44%) patients respectively. Pigmented macules over the body in 20(26%) and skin pain in 15(20%) were the other side effects. Less common side effects were burning sensation, nausea and leg oedema, found 9 (12%), 1(1.3%) and 19 (1.3%) patients, respectively. Multiple linear regression was applied to determine the factors influencing the response to NBUVB treatment (Table 4).

Table 4. Results of the multiple linear regressions.

Factors	Minimum to maximum range	Mean	Regression with response rate to NBUVB
Age	14-80 years	53 years	beta= - 0.161 p=0.161
Initial PASI score	6.4-50	25	beta = - 0.015 p=0.893
Cumulative dose	8863-95930 mJ/cm ²	37465 mJ/cm ²	beta = 0.202 p=0.182
Energy require to develop erythema	1200-5000 mJ/cm ²	2925 mJ/cm ²	beta = 0.166 p=0.429
Duration of illness	1-35 years	12 years	beta = -0.476 p=0.01*

beta= standardized coefficient

Duration of illness was shown to be the only significant factor influencing the response to NBUVB treatment among patients with chronic plaque psoriasis (Figure 1). The trend line of the response rate meets duration of illness at 20 years.

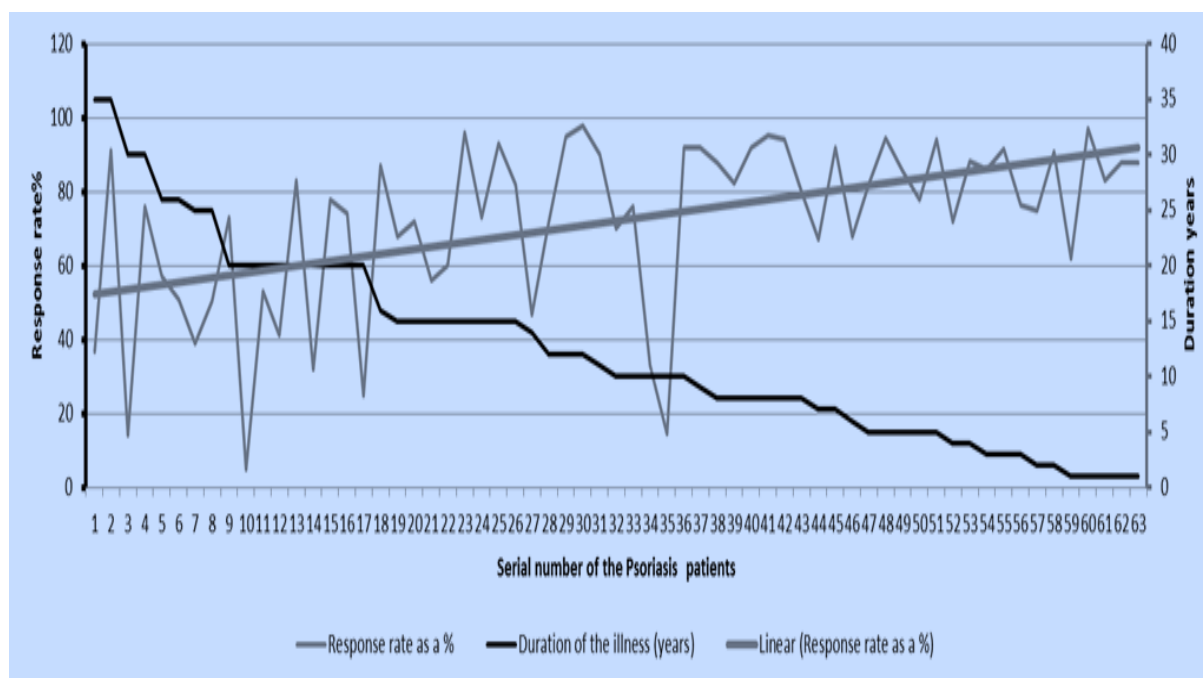


Figure1. Correlation between duration of the illness and response rate

Discussion

A study on prevalence of psoriasis in Sri Lanka conducted in 1978 estimated that the male to female ratio was 1:1[11]. The male-female ratio in the present study varied from this probably due to the fact that the sample was obtained from hospital-based population. Maximum number of 29 (46%) were in 41-60 year age group. Thirty seven percent was between 61-80 years of age. Mean age was 53 years. Psoriasis usually appears between 15-35 years of age and the study findings are in keeping with the expected age pattern. Response rate to NBUVB treatment in the present study indicates that 57% have shown 75%-89% PASI-75 clearance of the disease and 25% have achieved 50%-74% clearance (PASI-50). Altogether 82% of patients have achieved remarkable clearance of the disease without any combination with a biological agent. This is in contrast to studies in other countries which have shown different levels of efficacies with a combination of treatment methods. efalizumab, 1mg/kg/week and NBUVB have shown PASI-75 in 70% of patients compared to 22-39% patients receiving efalizumab monotherapy [12]. Similarly, the combination of NBUVB thrice a week and Efalizumab 1 mg/kg/week achieved PASI-75 in 65% of the patients after 12 weeks of treatment[13]. The etanercept and NBUVB combination is also found to have a synergistic effect. In a study where NBUVB thrice-a-week was combined with etanercept 50 mg twice-a-week, PASI-75 was achieved in 84.9% of the patients and PASI-100 was achieved in 26% of the patients [14]. Combination of methotrexate and NBUVB phototherapy was shown to provide more rapid clinical improvement with 95% patients achieving PASI 75 compared to 70% patients achieving PASI-75 with NBUVB monotherapy for chronic plaque-type psoriasis [15, 16].

In the present study majority (62%) needed only a low cumulative dose to achieve a clinical response. Twenty four percent received a moderate cumulative dose whereas only 14% needed a high cumulative dose. A significant number (43%) tolerated a moderate dose between 2000-4000 mJ/cm². A high dose of more than 4000 mJ/cm² was given only to 19%. Even though Fitzpatrick classification of skin type classification indicates relatively high tolerance of ultraviolet light, high degree of cumulative dose was tolerated by only 14% of patients and high dose of NBUVB was tolerated by 19% of patients. As Asian skins are brown, erythema alone is not a good indicator to determine tolerance to NBUVB. Therefore we used certain side effects like pruritus and skin pain as limiting factors of the therapy. It is interesting to note that 53% of our patients had pruritus.

On analysis of correlations between response to NBUVB and different study parameters, only the duration of illness had a statistically significant moderate correlation with response to treatment. (Fig1). Patients with longer duration of illness had poorer response rates to the NBUVB treatment. It was noted that the trend line of the response rate meets duration of illness at 20 years. Whether this is the demarcation to limit NBUVB therapy in chronic plaque is questionable. Further studies are needed to clarify this aspect. Lack of a concurrent control group precluded control of potential cofounders and some factors that may influence the response such as smoking and alcohol consumption were not considered in this study.

Conclusions

Response to NBUVB therapy seems to be higher when the duration of illness is shorter. Therefore, we need to consider NBUVB as a treatment option in the early stages of chronic plaque psoriasis.

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