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Original Research Article

Comparative Study of Therapeutic Efficacy of Puva, Puvasol and NBUVB in the Treatment of Chronic Plaque Type Psoriasis

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Abstract: Psoriasis is a chronic inflammatory disorder of the skin which causes disfigurement of skin. Treatment options for moderate to severe psoriasis are systemic therapies like methotrexate, cyclosporine, acitretin, biologic agents and phototherapy. This study was designed to compare the therapeutic efficacy of PUVA, PUVASOL and NBUVB in the treatment of chronic plaque type psoriasis involving more than 20% body surface area. PUVA therapy is an effective modality of treatment in chronic plaque type psoriasis. NBUVB therapy has equal efficacy to PUVA therapy in our study.

Keywords: Psoriasis, PUVA therapy, NBUVB therapy

INTRODUCTION:

Psoriasis is a disease of the skin, characterized by a chronic relapsing and variable clinical features. The cutaneous lesions are so distinct there by a clinical diagnosis is easy to make [1]. Various triggering factors such as infections, trauma, and medications may elicit a psoriatic phenotype in a predisposed individual [2]. The most pathognomonic skin lesions are well defined erythematous, scaly, indurated plaques, which are seen mainly over the extensor bony prominences and scalp. Plaques frequently occur on the extensor aspect of the elbows and knees, nevertheless it can affect any area, including the scalp, palmar aspect of hand, soles and external genitals. There is a bimodal age of onset, the first peak at 15-20 years of age and a second one at 55-60 years. The mean age of onset was about 28 years. The mean age of onset was higher for males than females. Treatment options for moderate to severe psoriasis are systemic therapies like methotrexate, cyclosporine, acitretin, biologic agents and phototherapy. This study was designed to compare the therapeutic efficacy of PUVA, PUVASOL and NBUVB in the treatment of chronic plaque type psoriasis involving more than 20% body surface area.

MATERIALS AND METHODS:

Sixty patients who attended the psoriasis outpatient clinic at the Department of Dermatology, Government Dharmapuri Medical College Hospital from July 2016 to December 2017 were included in the study. Sixty patients with chronic plaque type of psoriasis involving more than 20% of body surface area were randomly allocated to any one of the following three groups with informed consent. All were explained about the disease, benefits and side effects of the treatment. They were followed up weekly and reduction in PASI score was calculated and analyzed.

Inclusion criteria:

Patients with chronic plaque type of psoriasis involving more than 20% of body surface area.

Exclusion criteria:

1. Photosensitive disorders or history of photo damage, Pregnancy and Lactating women, Children, Previous or family history of malignant melanoma, H/O exposure to inorganic arsenic or ionizing radiation, Women contemplating conception.

PUVA THERAPY: PROCEDURE: [3]

0.6-0.8mg/kilogram body weight of 8-Methoxy Psoralen is administered orally, and after 1 to 3 hours whole body is irradiated with Ultra violet A. Repeated exposures are necessary for clearance of the disease, if pigmentation appears UV A doses have to be increased. After achievement of satisfactory clearance of the disease dosage is reduced. The last UV A dose is the maintenance dose. Two protocols which are commonly used are American protocol [4] & European protocol [5].

Initial dose determination	Skin photo type	MPD
No.of weekly treatments	2	4
Increments	Predetermined and fixed	Individualized and flexible
No. of weeks required for clearing	12.7	5.7
No. of exposures	25	20
Cumulative UVA dose	245J/ cm^2	96 J/ cm^2

NARROW BAND ULTRAVIOLET B THERAPY:

NBUVB is one of the novel therapeutic interventions now available in treating several dermatological conditions. Fisher identified that narrow band ultraviolet B radiation which has a wave length of 313 nanometer is efficient in clearing lesions. Even higher doses do not produce notable erythema [6]. Parish Jaenicke identified that clearance of psoriasis is better with wavelength of 313nm [7].

PROCEDURE:

The minimal dose of Ultraviolet B radiation that produces well defined erythema after 24 hours of exposure is the minimal erythema dose (MED). The test site is on the back/buttocks of around 1cm× 1 cm. The starting dose of therapy is computed based on MED. Initial dose is generally 70% of minimal erythema dose [8]. Pai *et al.;* [9] in his study showed that the mean MED for skin type four is 600 milli Joules/square centimetre whereas for skin type 5 it is 1100 milli Joules/square centimeter .

PUVASOL THERAPY:

Administration of Psoralen followed by exposure to sunlight is known as PUVASOL therapy. Trimethoxy psoralen is preferable for PUVASOL therapy. 10 AM to 2 PM is the best time for sun exposure. During first sitting of therapy exposure to sunlight is limited to 10 minutes. Then duration of exposure can be increased according to the response.

FOLLOW UP:

Patients were followed up every weekly, and PASI score was calculated at 0, 4, 8, 12 and 16 weeks for all three groups. These were compared and statiscally analyzed.

EFFICACY ASSESSMENT:

Severity and extent of psoriasis were evaluated using “Psoriasis Area and Severity Index” (PASI) score. Severity of Erythema (E), Desquamation (D) and Induration (I) was recorded on a 5 point scale as follows. 0-nil , 1-mild, 2- moderate, 3- severe, 4- very severe.

The area of involvement was recorded on a 7 point scale as follows-

0 – nil, 1 - <10%, 2 – 10-29%, 3 – 30 – 49%, 4 – 50-69%, 5 – 70- 89%, 6 – 90-100%

PASI was calculated as follows-

$$\mathbf{PASI = 0.1(E_H+I_H+D_H)\ AH + 0.2(E_U+I_U+D_U)\ AU + 0.3(E_T+I_T+D_T)\ AT + 0.4(E_L+I_L+D_L)}$$

A – Area, H – Head, U - Upper limb, T – Trunk, L - Lower limb

PASI REDUCTION:

The following tables shows the mean PASI score at baseline and reduction of mean PASI score at 4 weeks, 8 weeks, 12 weeks, 16 weeks in PUVA, NBUVB, PUVASOL groups.

RESULTS

Table 1: Shows mean reduction in PASI score among three groups

Duration	Mean PASI score		
	PUVA	NBUVB	PUVASOL
Baseline	32.20	31.04	31.59
4 weeks	20.76	20.82	24.96
8weeks	10.54	11.98	17.71
12 weeks	3.18	5.92	12.47
16 weeks	0.38	0.83	7.76

In PUVA group the mean PASI score at baseline is 32.20 and it was reduced to 0.38 at 16 weeks. In NBUVB group the mean PASI score while enrolling in study was 31.04 where as it was reduced to 0.83 at 16 weeks. In PUVASOL group the mean PASI score was 31.59 at baseline and it was reduced to 7.76 at 16 weeks of PUVASOL therapy. Therefore the mean reduction of PASI score at 16 weeks is more in PUVA group, followed by NBUVB group. PUVASOL has lesser reduction in mean PASI score among three groups.

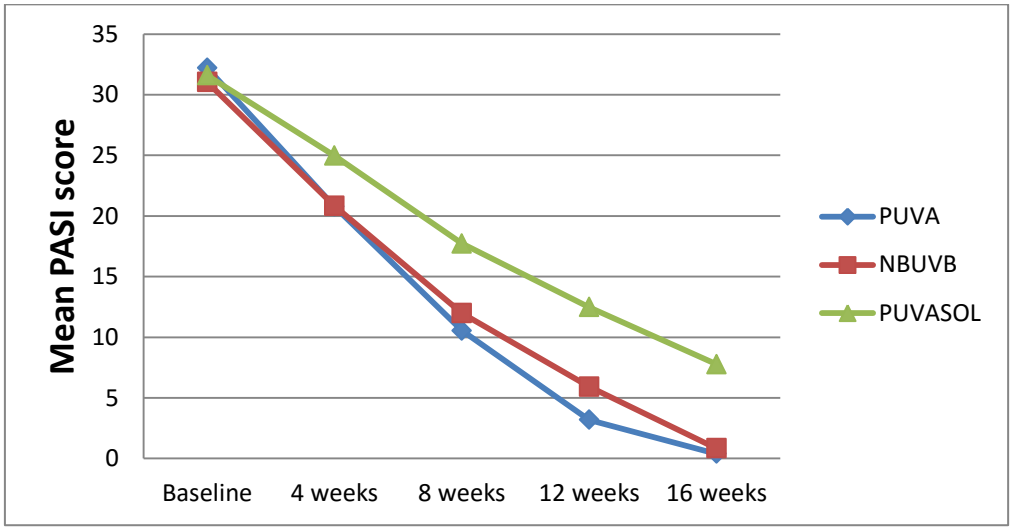

Fig-1: Showing mean reduction in PASI scores

Table 2: Mann-Whitney Test to compare the mean Flexural values between two groups

Variables	**P-Values**		
	PUVA vs NBUVB	**PUVA vs PUVASOL**	**NBUVB vs PUVASOL**
PASI 0	0.579	0.903	0.695
PASI 4	0.933	0.255	0.184
PASI 8	0.627	0.024	0.101
PASI 12	0.150	0.001	0.035
PASI 16	0.694	0.001	0.001

Table 2 shows P values by comparing three groups with one another. There was no statistically significant reduction in PASI score at 0, 4, 8, 12 and 16 weeks when PUVA and NBUVB. When PUVA and PUVASOL groups are compared there is no statically difference in reduction in PASI score at 0, 4, 8 weeks. But at 12 and 16 weeks there is statically significant ($P<0.001$) reduction in PASI score. When NBUVB and PUVASOL groups were compared there was no statistically significant difference in PASI score at 0, 4, 8, 12 weeks. However at 16 weeks there is statistically significant PASI reduction ($P<0.001$).

RESPONSE TO THERAPY

Table 3 – Response to treatment in PUVA group

Results	PUVA group	NBUVB group	PUVASOL group
Excellent	13	12	3
Good	5	5	12
Moderate	-	-	
Poor response	-	1	3
Discontinued	2	2	2

Based on percentage reduction in PASI score the results were graded as excellent (100%), good (75-100%), moderate (50- 75%) and poor (< 50%). Therefore in PUVA group 72.22% of patients had excellent response and 27.78 % of patients had good response at 16 weeks. Therefore in NBUVB group 60.0% of patients had excellent response and 25.0 % of patients had good response at 16 weeks. 5.0% had poor response. Therefore in PUVASOL group 15 % of patients had excellent response and 60 % of patients had good response at 16 weeks. 15% had poor response

SIDE EFFECTS:

The adverse effects in our study were minimal and none of the patients required discontinuation of therapy. In our study, the common side effects were erythema, nausea, initial exacerbation and pruritis. The adverse effect profile observed in our study was similar to that reported in the literature.

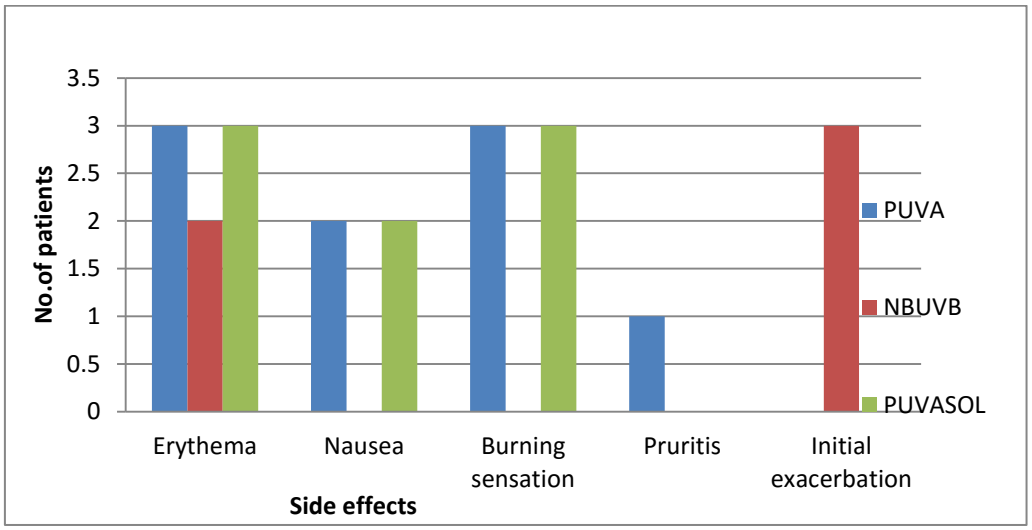

Fig-2: Showing adverse effects in three groups

DISCUSSION:

Psoralen ultraviolet A therapy, Narrow band ultraviolet B therapy and PUVASOL are the standard therapeutic regimens available for the management of psoriasis. There are few studies which compares the therapeutic efficacy of PUVA and NBUVB in treatment of psoriasis. No studies have compared the efficacy of PUVSOL with PUVA and NBUVB. So the present compares the therapeutic efficacy of PUVA, NBUVB and PUVASOL in the management of psoriasis. We enrolled 60 patients with chronic plaque type psoriasis involving more than 20% body surface area for the study. They were followed up weekly after initiating treatment. PASI score were calculated at 0, 4, 8, 12 and 16 weeks.

COMPARISION OF PUVA WITH NBUVB GROUP:

In PUVA group the mean baseline PASI score is 32.20 and mean PASI score at 16 weeks is 0.38. Therefore there is 98.9% reduction in PASI score at end of 16 weeks. In NBUVB group the mean baseline PASI score is 31.04 and at mean PASI score at 16 weeks is 0.83. Therefore there is 97.9% reduction in PASI score

at end of 16 weeks. From above data it is inferred that both groups showed good clearance of lesions after 16 weeks. The p value is 0.694 which is not statistically significant. However the mean cumulative dose for NBUVB (17.10 J/cm^2) is less than the mean cumulative dose for PUVA (21.00 J/cm^2). So both PUVA and NBUVB therapy produces clearance of lesions with equal efficacy, however the mean cumulative dose is lower for NBUVB. This observation in our study is similar to the study conducted by Gordon et al who did a randomized control study in 100 patients with plaque type psoriasis. An Indian study conducted by Dayal S et al from Haryana also shows similar results.

The mean number of exposure in PUVA group is 14.72 weeks and 14.88 weeks in NBUVB group which is more or less equal. Markham *et al.;* in his study showed that the mean number of exposure is lower in PUVA group than that of NBUVB group. Koo *et al.;* reported that tazarotene plus NBUVB phototherapy is significantly more effective than NBUVB phototherapy alone for treatment of psoriasis.

COMPARISION OF PUVA WITH PUVASOL GROUP:

In PUVA group the mean baseline PASI score is 32.20 and mean PASI score at 16 weeks is 0.38. Therefore there is 98.9% reduction in PASI score at end of 16 weeks. In PUVASOL group the mean baseline PASI score is 31.59 and mean PASI score at 16 weeks is 7.76. Therefore there is 75.44% reduction in PASI score at end of 16 weeks. From above data it is inferred that both groups PUVA group showed better clearance of lesions after 16 weeks. The p value < 0.005 this is statically significant. So PUVA therapy produces clearance of lesions with greater efficacy when compared to PUVSOL. The mean number of exposure in PUVA group is 14.72 weeks and 18.97 weeks in PUVASOL group which again shows PUVA therapy clears the lesion early when compared to PUVASOL therapy.

In our study 15% of patients in PUVASOL showed complete clearance of lesions, and 70% of patients showed marked improvement of lesions. In study conducted by Kar PK *et al.;* PUVASOL showed complete clearance in 32% of patients, marked improvement in 44% of patients and poor response in 24% of patients. 15 % of the patients in PUVASOL group showed poor response to treatment where as in study conducted by Sadhan Kumar Ghosh et al showed 60% of patients had poor response. They also showed that PUVASOL with methotrexate gives better results than PUVASOL therapy alone. The mean number of exposure in PUVA group is 14.72 weeks and 18.97 weeks in PUVASOL group. This shows PUVASOL therapy takes long time to clear the lesion.

COMPARISION OF NBUVB WITH PUVASOL GROUP

In NBUVB group the mean baseline PASI score is 31.04 and mean PASI score at 16 weeks is 0.83. Therefore there is 97.9% reduction in PASI score at end of 16 weeks. In PUVASOL group the mean baseline PASI score is 31.59 and at mean PASI score at 16 weeks is 7.76. Therefore there is 75.44 % reduction in PASI score at end of 16 weeks. From above data it is inferred that NBUVB showed better results in terms of clearance of lesions when compared to PUVASOL therapy after 16 weeks. The p value is <0.005 which is statistically significant. So NBUVB therapy produces better clearance of lesions than PUVASOL therapy. The mean number of exposure in NBUVB group is 14.88 weeks and 18.97 weeks in PUVASOL group. This shows PUVASOL therapy takes long time to clear the lesion. Markham and Collins in their study showed that both PUVA and NBUVB therapy are arrhtymogenic. They also reported that other side effects like nausea, headache, pruritis and alopecia were commonly observed in PUVA group. The above observation is similar to the present study.

Sadhan Kumar Ghosh *et al.;* reported that erythema, nausea and vomiting were common side effect with PUASOL therapy. Our study also shows similar results. Initial exacerbation was noted in 3 of our patients in NBUVB group, but newer lesions ceased to appear with continuation of therapy. This could be due to immunomodulatory effect of NBUVB. Pruritis was noted in one of our patients in PUVA group which subsided with regular use of emollients and continuation of therapy. It is assumed to be related to prostaglandin release.

CONCLUSION:

PUVA therapy is an effective modality of treatment in chronic plaque type psoriasis. NBUVB therapy has equal efficacy to PUVA therapy in our study. The mean cumulative dose is almost equal for both PUVA and NBUVB therapy. However the mean number of exposure is less for PUVA group when compared to NBUVB group. When PUVA and NBUVB are compared there is no statistically significant difference in mean PASI score reduction at 16 weeks. The percentage of reduction of mean PASI AT 16 weeks in PUVA group is 98.9% and in NBUVB group is 97.9%. So both were almost equally effective. But the duration of treatment was taken into account

PUVA therapy scores over the NBUVB therapy. When PUVA and NBUVB therapy are compared with PUVASOL the rate of clearance of lesions in later group is poor. All the side effects noted in our study were minor and they were treated conservatively. In conclusion our study has shown that both PUVA and NBUVB groups achieved >75% or complete clearance at end of 16 weeks when compared to PUVASOL group. But PUVA group achieved faster clearance with less number of exposures as compared to NBUVB group.

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