ORIGINAL RESEARCH

Comparative Study on the Effectiveness of Narrowband UVB Therapy vs. PUVA in the Treatment of Vitiligo

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ABSTRACT

Aim: The aim of this study was to compare the effectiveness of Narrowband UVB (NB-UVB) therapy and Psoralen plus Ultraviolet A (PUVA) therapy in treating patients with generalized vitiligo over a 3 months period. **Materials and Methods:** This randomized, controlled, comparative study involved 100 patients diagnosed with generalized vitiligo, equally divided into two groups. Group A (n = 50) received NB-UVB therapy three times a week, while Group B (n = 50) received PUVA therapy twice a week. Patients were included if they were between 18-50 years of age, had more than 10% of their body surface area affected by vitiligo, and had not undergone prior phototherapy within the last six months. The primary outcome was the percentage of repigmentation in the treated areas, assessed at baseline, one month, and three months. Secondary outcomes included patient-reported satisfaction and adverse effects such as erythema, pruritus, and blistering. **Results:** At baseline, both groups had comparable demographic characteristics, including age, gender, and extent of vitiligo ($p > 0.05$). After one month, the majority of patients in both groups had less than 25% repigmentation, with 56% in Group A and 60% in Group B. By three months, more significant repigmentation was observed, with 36% of patients in Group A achieving 51-75% repigmentation, compared to 30% in Group B. Additionally, 20% of Group A and 26% of Group B achieved over 75% repigmentation. Although PUVA showed slightly higher rates of greater repigmentation, the differences were not statistically significant ($p > 0.05$). Adverse effects were more frequent in Group B, with erythema reported in 28% of PUVA patients compared to 20% in NB-UVB patients, but these differences were not significant. Patient satisfaction scores were similar between the groups, with Group A scoring 8.5 and Group B scoring 8.3 ($p > 0.05$). **Conclusion:** Both Narrowband UVB (NB-UVB) and PUVA therapies were effective in promoting repigmentation in vitiligo patients, with no statistically significant differences in overall outcomes. NB-UVB had a slight advantage in tolerability, while PUVA therapy resulted in marginally higher repigmentation rates. Both therapies were well-received by patients, and the choice between them should be individualized based on patient preferences and side effect profiles.

Keywords: Vitiligo, Narrowband UVB, PUVA, Phototherapy, Repigmentation.

INTRODUCTION

Vitiligo is a chronic dermatological condition characterized by the loss of pigmentation in the skin, leading to white patches on various parts of the body. This loss of pigmentation occurs when the melanocytes, the cells responsible for producing melanin (the pigment that gives skin its color), are destroyed or malfunction. Vitiligo can affect individuals of any age, gender, or ethnicity, and while it is not life-threatening or contagious, it can significantly impact a person's psychological and emotional well-being due to the visible nature of the condition. The exact cause of vitiligo is still unknown, but it is believed to be an autoimmune disorder in which the immune system mistakenly attacks and destroys melanocytes. Other contributing factors may include genetic predisposition, environmental triggers, and oxidative stress.[1]One of the main goals of vitiligo treatment is to restore pigmentation to the affected areas of the skin, and this can be achieved through various therapeutic options. Among the most widely used treatments are Narrowband UVB (NB-UVB) phototherapy and Psoralen plus Ultraviolet A (PUVA) therapy. Both NB-UVB and PUVA aim to stimulate melanocyte activity and promote repigmentation of the depigmented skin. However, the mechanisms by which they achieve these results differ, as do their safety profiles, tolerability, and overall effectiveness.[2]NB-UVB therapy uses a specific wavelength of ultraviolet light (311-313 nm) that has been found to be effective in treating vitiligo without the need for psoralen, a photosensitizing agent. This

therapy is delivered via a phototherapy unit, and patients typically undergo treatment two to three times a week over several months. NB-UVB has become the preferred treatment for many vitiligo patients due to its relatively good safety profile, ease of use, and fewer side effects compared to other forms of phototherapy. In particular, NB-UVB does not require the ingestion of photosensitizing medications, making it a more convenient option for many patients. Additionally, NB-UVB is suitable for a wide range of skin types and is generally well-tolerated, even in children and individuals with sensitive skin.[3]PUVA therapy, on the other hand, involves the administration of psoralen (either orally or topically) followed by exposure to UVA light (320-400 nm). Psoralen enhances the skin's sensitivity to UVA, making it more effective in stimulating melanocytes and promoting repigmentation. However, because of the photosensitizing nature of psoralen, PUVA carries a higher risk of side effects such as erythema (redness), blistering, and long-term risks such as premature aging of the skin and an increased risk of skin cancer. PUVA is typically reserved for more extensive cases of vitiligo or for patients who have not responded well to other treatments, and treatment sessions are generally less frequent than NB-UVB, occurring about twice a week.[4,5]Both NB-UVB and PUVA have been shown to be effective in achieving repigmentation in vitiligo patients, but there is ongoing debate regarding which treatment is more effective, particularly in terms of long-term results and safety. Some studies suggest that PUVA may provide better results in terms of overall repigmentation, particularly in individuals with darker skin types, while NB-UVB is favored for its safer profile and fewer side effects. The decision to use one therapy over the other often depends on the extent of the disease, patient preference, skin type, and the treating physician's experience.[6-8]In light of the ongoing need to determine the most effective and safe treatment options for vitiligo, this study aims to conduct a comparative analysis of NB-UVB and PUVA therapy in treating vitiligo. The primary focus is to assess the percentage of repigmentation achieved in patients undergoing each therapy and to evaluate patient satisfaction, adverse effects, and overall tolerability.

MATERIALS AND METHODS

This was a randomized, controlled, comparative study aimed at evaluating the effectiveness of Narrowband UVB (NB-UVB) therapy versus Psoralen plus Ultraviolet A (PUVA) therapy in the treatment of vitiligo. The study was conducted over a period of 12 weeks and involved two groups of patients undergoing different phototherapy treatments.A total of 100 patients diagnosed with generalized vitiligo were enrolled in the study. Patients were randomly divided into two groups, with 50 patients in each group.

- **Group A (n = 50):** Patients received Narrowband UVB therapy.
- **Group B (n = 50):** Patients received PUVA therapy.

Inclusion Criteria

- Patients aged 18-50 years.
- Diagnosed with generalized vitiligo affecting more than 10% of the body surface area.
- No previous history of phototherapy or systemic treatment for vitiligo within the past 6 months.
- Willingness to comply with the study protocol and attend all treatment sessions.

Exclusion Criteria

- Pregnant or breastfeeding women.
- Patients with a history of photosensitivity disorders or skin cancer.
- Patients with other dermatological conditions affecting the study area.
- Use of immunosuppressive or systemic corticosteroid therapy in the last 3 months.
- Uncontrolled chronic diseases such as diabetes, hypertension, or cardiac disorders.

Methodology

Patients were randomly assigned to either Group A or Group B using a computer-generated randomization sequence. Neither the patients nor the investigators were blinded to the treatment assignments due to the different nature of the therapies; however, the outcome assessors were blinded to minimize bias in evaluating treatment efficacy.

Group A (NB-UVB Therapy): Patients in this group received NB-UVB therapy three times a week using a UVB phototherapy device emitting light with a wavelength of 311-313 nm. The starting dose was based on the patient's skin type, and the dose was gradually increased at each session, depending on the patient’s response and tolerance.

Group B (PUVA Therapy): Patients in this group received PUVA therapy two times a week. Prior to each session, patients took an oral dose of 8-methoxypsoralen (0.6 mg/kg), and after 2 hours, were exposed to UVA light using a PUVA phototherapy unit emitting light with a wavelength of 320-400 nm. The initial UVA dose was determined based on the patient's skin type and gradually increased at each session.

The primary outcome measure of the study was the percentage of repigmentation achieved in the treated areas, assessed through clinical photographs and standardized scoring by blinded assessors at baseline, One month, and 3 month. Repigmentation was categorized into four levels: less than 25%, 25-50%, 51-75%, and greater than 75%. The secondary outcomes included patient-reported improvement, treatment satisfaction, and the occurrence of any adverse effects such as erythema, pruritus, and blistering. Patient satisfaction was evaluated using a

10-point visual analog scale (VAS) at the conclusion of the treatment period. Data collection involved recording baseline demographic information such as age, gender, duration of vitiligo, and the extent of the disease for each patient. Clinical assessments, including the percentage of repigmentation and adverse effects, were performed at baseline, one month, and 3 month to monitor progress and evaluate treatment efficacy.

Statistical Analysis: Data were analyzed using SPSS version 21.0. Paired t-tests were used to compare the baseline and post-treatment repigmentation within each group. An independent t-test was used to compare the effectiveness of NB-UVB and PUVA between the groups. Chi-square tests were performed to assess the incidence of adverse effects between the two groups. Statistical significance was set at $p < 0.05$.

RESULTS

Table 1: Baseline Characteristics of Study Participants

This table presents the demographic and clinical baseline characteristics of the study participants in both treatment groups. The mean age in Group A (NB-UVB) was 31.2 ± 6.5 years, while in Group B (PUVA) it was 32.1 ± 7.0 years. The p-value of 0.52 indicates no significant difference in age distribution between the two groups. The gender distribution in Group A was 22 males and 28 females, and in Group B, 24 males and 26 females, with a p-value of 0.68, showing no significant difference in gender distribution. The mean duration of vitiligo was slightly shorter in Group A (4.8 ± 3.2 years) compared to Group B (5.1 ± 3.1 years), but the difference was not statistically significant (p = 0.57). The baseline body surface area affected by vitiligo was comparable between the groups, with Group A having 16.5% ± 4.1% and Group B 17.2% ± 4.5%, and the p-value of 0.39 suggests no significant difference between the groups.

Table 2: Repigmentation at One Month

At the one-month mark, the percentage of repigmentation in each group was similar. In Group A (NB-UVB), 56% of patients achieved less than 25% repigmentation, while in Group B (PUVA), 60% of patients achieved this level of repigmentation, with a p-value of 0.74, indicating no significant difference between the two groups. The proportion of patients achieving 25-50% repigmentation was slightly higher in Group A (24%) than in Group B (20%). In both groups, 12% of patients achieved 51-75% repigmentation, and 8% achieved greater than 75% repigmentation. These results suggest that both NB-UVB and PUVA therapies provide similar early responses in terms of repigmentation.

Table 3: Repigmentation at Three Months

At three months, repigmentation levels increased significantly in both groups. In Group A (NB-UVB), 36% of patients achieved 51-75% repigmentation, compared to 30% in Group B (PUVA). Similarly, 20% of Group A patients achieved more than 75% repigmentation, while 26% of Group B patients achieved this level. The p-value of 0.65 suggests no statistically significant difference between the groups at three months. However, it is evident that more patients in Group B achieved repigmentation rates greater than 75%, whereas Group A had more patients in the 51-75% range.

Table 4: Adverse Effects Reported by Patients

This table presents the incidence of common adverse effects reported by patients in both treatment groups. In Group A (NB-UVB), 20% of patients experienced erythema, while 28% of patients in Group B (PUVA) reported this adverse effect, with a p-value of 0.39 indicating no significant difference. Pruritus was reported by 24% of patients in Group A and 32% of patients in Group B (p = 0.34). Blistering was observed in 12% of patients in Group A and 20% in Group B, with a p-value of 0.27, showing no significant difference between the two groups. Overall, the side effects were slightly more frequent in the PUVA group, but the differences were not statistically significant.

Table 5: Patient Satisfaction Scores at Three Months

In terms of patient satisfaction at the end of three months, Group A (NB-UVB) had a mean satisfaction score of 8.5 ± 1.1, while Group B (PUVA) had a mean score of 8.3 ± 1.2. The p-value of 0.46 suggests that the difference in satisfaction between the two groups was not statistically significant. These results indicate that both treatments were well received by the patients, with high levels of satisfaction reported across both groups.

Table 6: Comparison of Repigmentation Between Groups

This table compares the primary outcome of repigmentation between the two groups at the end of the study. Group A (NB-UVB) had a mean repigmentation of 58.2% ± 15.4%, while Group B (PUVA) had a mean repigmentation of 55.6% ± 17.2%. The p-value of 0.37 indicates no statistically significant difference between the two groups in terms of overall repigmentation. This suggests that both NB-UVB and PUVA therapies were similarly effective in promoting repigmentation in vitiligo patients over the 12-week treatment period.

Table 1: Baseline Characteristics of Study Participants

Characteristics	Group A (NB-UVB)	Group B (PUVA)	p-value (t-test/Chi-square)
Sample Size (n)	50	50	-
Mean Age (years)	31.2 ± 6.5	32.1 ± 7.0	0.52
Gender Distribution (M/F)	22/28	24/26	0.68
Mean Duration of Vitiligo (years)	4.8 ± 3.2	5.1 ± 3.1	0.57
Baseline Body Surface Area Affected (%)	16.5 ± 4.1	17.2 ± 4.5	0.39

Table 2: Repigmentation at One Month

Repigmentation (%)	Group A (NB-UVB)	Group B (PUVA)	p-value
< 25%	28 (56%)	30 (60%)	0.74
25-50%	12 (24%)	10 (20%)	
51-75%	6 (12%)	6 (12%)	
> 75%	4 (8%)	4 (8%)	

Table 3: Repigmentation at Three Months

Repigmentation (%)	Group A (NB-UVB)	Group B (PUVA)	p-value
< 25%	8 (16%)	10 (20%)	0.65
25-50%	14 (28%)	12 (24%)	
51-75%	18 (36%)	15 (30%)	
> 75%	10 (20%)	13 (26%)	

Table 4: Adverse Effects Reported by Patients

Adverse Effect	Group A (NB-UVB) (%)	Group B (PUVA) (%)	p-value (Chi-square)
Erythema	10 (20%)	14 (28%)	0.39
Pruritus	12 (24%)	16 (32%)	0.34
Blistering	6 (12%)	10 (20%)	0.27

Table 5: Patient Satisfaction Scores at Three Months

Satisfaction Level	Group A (NB-UVB)	Group B (PUVA)	p-value (t-test)
Mean Satisfaction Score (VAS 1-10)	8.5 ± 1.1	8.3 ± 1.2	0.46

Table 6: Comparison of Repigmentation Between Groups

Outcome	Group A (NB-UVB)	Group B (PUVA)	p-value (t-test)
Mean Repigmentation (%)	58.2 ± 15.4	55.6 ± 17.2	0.37

DISCUSSION

The results of this study demonstrate that both Narrowband UVB (NB-UVB) and PUVA therapies are similarly effective in treating generalized vitiligo. The baseline characteristics of the participants show no significant differences between the two groups in terms of age, gender distribution, or the extent of vitiligo, allowing for a fair comparison between the treatments. These findings are consistent with prior studies, such as that by Njoo et al. (2000), which also found no demographic biases influencing the outcomes of NB-UVB or PUVA treatments for vitiligo.[9]The repigmentation rates at one month indicate that both treatment groups achieved similar early responses, with 56% of patients in Group A (NB-UVB) and 60% in Group B (PUVA) showing less than 25% repigmentation. These early-stage results are in line with previous studies, such as Yones et al. (2007), who reported that both NB-UVB and PUVA are slow to induce visible repigmentation within the first month of treatment.[10] The slight difference in the proportion of patients achieving 25-50% repigmentation between the groups (24% in NB-UVB and 20% in PUVA) suggests that NB-UVB may have a marginal advantage in initial treatment responses, but this difference is not statistically significant.By the three-month mark, repigmentation levels had improved significantly in both groups. In Group A, 36% of patients achieved 51-75% repigmentation, compared to 30% in Group B. Furthermore, 20% of NB-UVB patients achieved more than 75% repigmentation, compared to 26% of PUVA patients. The p-value of 0.65 indicates no significant difference in repigmentation between the two therapies. This finding is supported by Westerhof and Nieuweboer-Krobotova (1997), who found that long-term outcomes of NB-UVB and PUVA are similar in terms of repigmentation effectiveness.[11] However, our study slightly favors PUVA in patients achieving over 75% repigmentation, a result echoed by Parsad et al. (2006), who suggested that PUVA therapy might yield higher repigmentation in patients with darker skin types.[12]In terms of adverse effects, both therapies were associated with similar rates of

side effects, although the PUVA group reported slightly higher incidences of erythema (28% vs. 20%), pruritus (32% vs. 24%), and blistering (20% vs. 12%). While none of these differences reached statistical significance, it is noteworthy that PUVA tends to cause more skin irritation, as supported by the findings of Ibbotson et al. (1995).[13] NB-UVB therapy is often preferred in clinical practice due to its favorable side effect profile, particularly in minimizing long-term risks such as phototoxicity and skin aging, which are more common in PUVA-treated patients.The patient satisfaction scores at the end of the study show that both therapies were well-received, with no significant difference in satisfaction between the two groups ($p = 0.46$). Group A (NB-UVB) had a slightly higher mean satisfaction score (8.5) compared to Group B (PUVA) (8.3), which could be attributed to the lower incidence of adverse effects in the NB-UVB group. Previous studies, such as that by Scherschun et al. (2005), have also shown that patients generally prefer NB-UVB due to its convenience (no need for psoralen ingestion) and fewer side effects, which may explain the slightly higher satisfaction scores in this group.[14]The primary outcome measure of mean repigmentation at the end of the study shows no statistically significant difference between the two groups ($p = 0.37$), with Group A (NB-UVB) achieving a mean repigmentation of 58.2% and Group B (PUVA) achieving 55.6%. This result is consistent with the findings of El-Mofty et al. (2006), who reported that both NB-UVB and PUVA therapies provide comparable repigmentation outcomes in vitiligo patients.[15]However, our study suggests that NB-UVB may be slightly more effective for patients who are concerned about long-term side effects and prefer a more convenient therapy, while PUVA may still be a viable option for those seeking more aggressive treatment outcomes, especially in skin types IV-VI.

CONCLUSION

In conclusion, this comparative study demonstrated that both Narrowband UVB (NB-UVB) and PUVA therapies are effective in promoting repigmentation in patients with generalized vitiligo. While NB-UVB showed slightly better tolerability with fewer adverse effects, PUVA therapy was associated with marginally higher repigmentation rates, particularly in patients achieving more than 75% repigmentation. Both treatments were well-tolerated, and patient satisfaction was high in both groups. The choice between NB-UVB and PUVA should consider individual patient preferences, skin type, and tolerance to side effects, with both therapies offering viable options for vitiligo management.

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