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Efficacy of Narrow-Band Ultraviolet B on Atopic Dermatitis

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Abstract: *Aim*: To evaluate the current role of narrowband ultraviolet B in the treatment of atopic dermatitis. *Methods*: Thirty patients with atopic dermatitis, their ages ranged from 5 to 17 years had been participated in the study. They were divided randomly into two equal groups. . Group A (Study group): composed of fifteen children suffering from atopic dermatitis and received narrow-band ultraviolet B, 3 times /week for 12 weeks and topical emollient daily. Group B (Control group): composed of fifteen children suffering from atopic dermatitis and received only topical emollient daily for 12 weeks. *Results*: The statistical analysis by Wilcoxon signed ranks test revealed there were significantly ($P = 0.0001$; $P<0.05$) decreased in Dermoscopy assessment at post treatment compared to pre-treatment within both groups. The statistical analysis by Wilcoxon signed ranks test revealed there were significantly ($P = 0.001$; $P<0.05$) decreased in SCORAD scale assessment at post treatment compared to pre-treatment within study group and control group. *Conclusions*: The narrowband ultraviolet B had a significant effect on the treatment of atopic dermatitis.

Key words: Atopic Dermatitis and Narrow-Band Ultraviolet B

INTRODUCTION

Atopic dermatitis (AD) also known as atopic eczema, is a common inflammatory skin disease characterized by a chronic and relapsing course. It affects patients of all ages, although it is more common in children. It is clinically identified by eczematous and pruritic lesions which can cause dramatic deterioration in quality of life for patients and their families [1].

Phototherapy is the use of non-ionizing radiation, primarily in the ultraviolet spectrum, to treat disease. In dermatology, ultraviolet (UV) phototherapy remains an established, lower cost and often preferred option for many common skin conditions, despite the introduction of newer potent biologics [2].

UVB radiation primarily acts on cells at the epidermis and the epidermodermal junction, whereas UVA radiation affects epidermal and dermal components, especially dermal blood vessels [3].

Ultraviolet light, adjacent to visible light on the electromagnetic spectrum, is of a shorter wavelength than visible light and thus carries more energy. Ultraviolet light can be further divided into three subcategories: UVC (200-290 nm), UVB (290-320 nm) and UVA (320-400 nm). Most UV radiation that reaches the earth is UVA. Approximately 5% of UVB is present in terrestrial sunlight. UVC is typically filtered by the ozone layer. The depth of light penetration is critical for phototherapy. UVB is generally absorbed in the epidermis and upper dermis, whereas UVA (because of its longer wavelengths) penetrates well into the dermis [4].

UV radiation has immunomodulatory effects that lead to improvement of inflammatory skin diseases. In animal and human models, UVB inhibits immune responses, likely related to induction of T-cell apoptosis. NB-UVB was initially shown to induce immune suppression followed by normalization of epidermal hyperplasia, supporting an immune regulation of the epidermal pathology in this disease [5].

Skin colonization by Staphylococcus aureus and Pityrosporum orbiculare may be prevented or reduced by the antibacterial effect of UV radiation. In particular,

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narrow-band (NB)-UVB radiation has been proved to reduce production of super antigens and alter mRNA levels of antimicrobial peptides [6].

So, this study was conducted to investigate efficacy of narrow-band ultraviolet B on atopic dermatitis patients.

MATERIALS AND METHODS

Study Design: The study was designed as a prospective, randomized, controlled trial.

Participants: Thirty children suffered from atopic dermatitis, their eges ranged from 5 to 17 years and their were randomly divided into two groups of equal numbers; Group A (Study group): This group was composed of fifteen children suffering from atopic dermatitis and they were received topical emollient daily and narrow-band ultraviolet B, 3 times /week for 12 weeks. Group B (Control group): This group was composed of fifteen children suffering from atopic dermatitis and they were received topical emollient daily for 12 weeks. The participants were excluded if they had history of photosensitivity or photosensitive skin diseases, infection or extensive oozing lesions, melanoma & non melanoma skin cancer and lactating or pregnant patients.

Interventions: Group (A) included 15 children suffering from atopic dermatitis and they were received topical emollient daily and narrow-band ultraviolet B, 3 times / week for 12 weeks. Group (B) included 15 children suffering from atopic dermatitis and they were received topical emollient daily for 12 weeks.

Outcome Measures

SCORAD Scale: The SCORAD index consists of the interpretation of the extent of the disorder (A: according to the rule of nines; 20% of the score), the intensity composed of six items (B: erythema, oedema / papules, effect of scratching, oozing /crust formation, lichenification and dryness; 60% of the score; each item has four grades: 0, 1, 2, 3) and subjective symptoms (C: itch, sleeplessness; 20% of the score). It is essential to use the most representative lesion for scoring purposes rather than the most severe or mildest lesion.

Dermoscopy: Is a noninvasive diagnostic technique that permits the visualization of morphologic features that are not visible to the naked eye, thus representing a link between macroscopic clinical dermatology and microscopic dermatopathology. This 'sub-macroscopic' observation of the skin is currently used for the examination of pigmented skin tumors and in a recent guideline on dermoscopy, an overview on the specific patterns of pigmented skin tumors has been given.

Statistical Analysis: Prior for final analysis, data were screened, for normality assumption test by using Shapiro-Wilk test ($P<0.05$) and homogeneity of variance by Levene's test ($P<0.05$). The data was not normally distributed and non-parametric analysis. The statistical analysis was conducted by using statistical SPSS Package program version 25 for Windows (SPSS, Inc., Chicago, IL). All data are expressed as mean and standard deviation for Dermoscopy assessment and SCORAD scale assessment variables. Wilcoxon signed ranks test to compare within each group and using Mann-Whitney test to compare between two groups. All statistical analyses were significant at level of probability less than an equal 0.05 ($P \leq 0.05$).

RESULTS AND DISCUSSION

A total of 30 patients participated in this study, they were randomly distributed into 2 groups (15 patients/ group). The statistical analysis within each group (Table 1 and Figure 1) revealed that there were significantly decreased in post treatment of Dermoscopy assessment ($P = 0.0001$; $P<0.05$) and SCORAD scale assessment ($P = 0.001$; $P<0.05$) compared to pre-treatment within study and control groups. Moreover, study group improved Dermoscopy assessment (78.23%) and SCORAD scale assessment (24.64%) than control group (74.51 and 17.13%, respectively).

The statistical analysis between study group and control group (Table 1 and Figure 2) showed no significant differences in mean values of pre-Dermoscopy assessment ($P = 0.555$; $P>0.05$) and pre-SCORAD scale assessment ($P = 0.089$; $P>0.05$). However, there were significant differences in the mean values of post-Dermoscopy assessment ($P = 0.0001$; $P<0.05$) and post-SCORAD scale assessment ($P = 0.0001$; $P<0.05$) between study group and control group.

Johnson-Huang *et al*. [5] reported that UV radiation has immunomodulatory effects that lead to improvement of inflammatory skin diseases. In animal and human models, UVB inhibits immune responses, likely related to induction of T-cell apoptosis. NB-UVB was initially shown to induce immune suppression followed by normalization of epidermal hyperplasia, supporting an

Table 1: Comparison Dermoscopy assessment and SCORAD scale assessment variables within and between two groups

Variables		Groups (Mean ±SD) Study group (n=15)	Control group (n=15)	*P*-value
Dermoscopy assessment	Pre-treatment	8.27 ±0.70	8.40 ±0.73	0.555
	Post-treatment	1.80 ±0.67	6.33 ±0.90	0.0001*
	Change	6.47	2.07	
	Improvement %	78.23%	24.64%	
	P-value	0.0001*	0.0001*	
SCORAD scale assessment	Pre-treatment	47.58 ±5.49	43.60 ±7.46	0.089
	Post-treatment	12.13 ±1.95	36.13 ±7.36	0.0001*
	Change	35.45	7.47	
	Improvement %	74.51%	17.13%	
	P-value	0.001*	0.001*	

SD: standard deviation P-value: probability value * Significant (P<0.05)

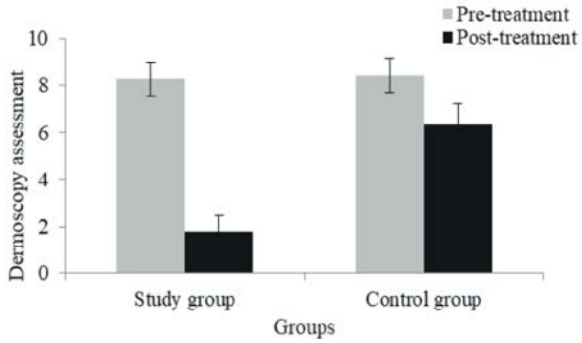

Fig. 1: Mean values of pre- and post-treatment Dermoscopy assessment in study and control groups

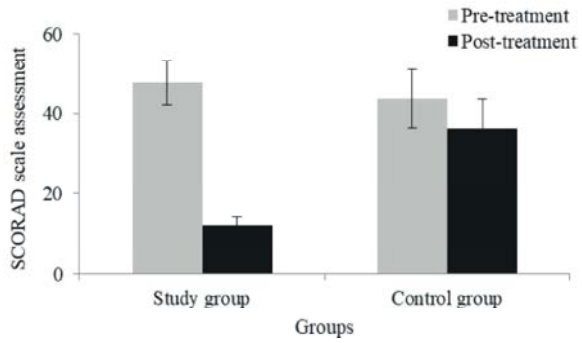

Fig. 2: Mean values of pre- and post-treatment SCORAD scale assessment in study and control groups

immune regulation of the epidermal pathology in this disease. Subsequently, NB-UVB was found to suppress major T-cell pathways involved in disease pathogenesis, namely the Th17/IL-23 and Th1 pathways. There was a significant reduction in IFN-γ gene expression with NB-UVB, although the reductions in IL-17 and IL-22 were found to better correlate with the clinical response. Similarly, our study shows strong suppression of the Th2 and "T22" axes in AD patients following NB-UVB, together with normalization of epidermal barrier function. We also found significant reductions in inflammatory cell subsets (including T-cells, IDECs and "atopic" DCs.

Grace and John [7] founded that the main advantage of NB-UVB therapy over PUVA is convenience. No topical or oral medications are needed. Phototoxic reactions are not a concern and it is thought to be safer for children. Thus, NB-UVB may be a better first-line treatment which coincided with the results of the current study.

In addition to Alshiyab *et al*. [8] revealed that the NB-UVB also benefited from other aspects of regular hospital attendances other than the phototherapy itself but the magnitude and duration of improvements strongly suggests that NB-UVB was effective. Children were not

randomized as this was felt to be unethical. The NB-UVB cohort who were significantly worse than the unexposed cohort at baseline, were clinically and statistically significantly better than the unexposed cohort after the course of phototherapy (primary outcome). The difference in disease activity and percentage surface area affected between the two cohorts remained significant 3 and 6 months post treatment. More patients were clear at 3 months post NB-UVB than at the end of the course suggesting that the maximal effect of UV radiation is seen some time after the course. At 6 months post treatment, some patients were starting to relapse although overall the effect was still well maintained.

Collins and Ferguson [9] found that nine of 32 patients got 'excellent results'. Our results are similar to those found by Clayton *et al.* [11] who reviewed the case notes of 50 children with severe eczema and found that 40% cleared after a course of NB-UVB (41% cleared in this study).

Jury *et al*. [10] that observed 25 children with AD who were treated with NB-UVB. They reported that 68% of children achieved minimal residual disease after treatment. However, they did not comment on the eczema severity, length of remission or whether topical treatment was continued during treatment with NB-UVB.

CONCLUSIONS

The results obtained from the current study and the discussion that followed it was concluded that: NB-UVB was effective in treatment of atopic dermatitis because its biological effects in dermatologic disorders through several mechanisms.

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Conflict of Interest: The authors have no conflict of interest to declare

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REFERENCES

1. Bieber, T., 2010. Atopic dermatitis: Ann. Dermatol., 22: 125-137.
2. Vangipuram, R. and S. Feldman, 2016. Ultraviolet phototherapy for cutaneous diseases a concise review: Oral Diseases, 22: 253-259.
3. Weichenthal, M. and T. Schwarz, 2005. Phototherapy: how does UV work?: Photodermatol. Photoimmunol. Photomed, 25: 260-266.
4. Baron, E. and A. Suggs, 2014. Introduction to photobiology: Dermatol. Clin., 32: 255-266.
5. Johnson-Huang, L., M. Suarez-Farinas, M. Sullivan-Whalen, P. Gilleaudeau, J. Krueger and M. Lowes, 2010. Effective narrow-band UVB radiation therapy suppresses the IL-23/IL-17 axis in normalized psoriasis plaques: J. Invest. Dermatol., 130: 2654-63.
6. Garritsen, F., M. Brouwer, J. Limpens and P. Spuls, 2014. Photo (chemo) therapy in the management of atopic dermatitis: An updated systematic review with implications for practice and research: Br. J. Dermatol., 170: 501-13.
7. Grace, D. and Y. John, 2004. Narrow-band ultraviolet B radiation: a review of the current literature: International Journal of Dermatology, 43: 555-56.
8. Alshiyab, D., C. Edwards, A. Chin and Anstey, 2014. Targeted ultraviolet B phototherapy: Definition, Clinical Indications and Limitations.
9. Collins, P. and J. Ferguson, 1995. Narrowband (TLO1) UVB air-conditioned phototherapy for atopic eczema in children: Br. J. Dermatol., 133: 653-5.
10. Jury, C., P. McHenry, A. Burden, R. Lever and D. Bilsland, 2006. Narrowband ultra-violet B (UVB) phototherapy in children: Clin. Exp. Dermatol., 31: 196-9.