

ORIGINAL ARTICLE

308 nm excimer lamp in combination with topical tacrolimus: A retrospective study of its efficacy and safety in childhood vitiligo

BS Chandrashekar, N Shobha, P

Department of Dermatology, Cutis, Academy of Cutaneous Sciences, Bangalore

ABSTRACT

Vitiligo is a chronic, polygenic dyschromia that presents with multiple depigmented macules and patches. Among the various therapeutic modalities for treatment of vitiligo in children, phototherapy as one of the mainstay treatments has varying therapeutic efficacy. There is limited data regarding the use of combination of tacrolimus and 308 nm excimer lamp for treatment of vitiligo in children.

The aim of the present study is to retrospectively assess the efficacy and tolerability of 308 nm Excimer lamp in combination with topical tacrolimus to treat vitiligo in children below 17 years with skin type III, IV and V.

Methods: Case sheets and photographs of 47 vitiligo patches from 24 children (male = 9, female = 15), <17 years were evaluated in this study. Data of patients with active disease and stable vitiligo not treated previously were chosen for this study. The patches were treated with topical tacrolimus daily and excimer lamp thrice weekly, for a maximum of 20 sittings.

Results: Of the 47 patches, 35 patches achieved repigmentation accounting to 74.4% of the total patches. The repigmentation response was good in ultraviolet (UV) sensitive areas but minimal in UV resistant areas. All the patches retained pigmentation during the follow-up period of 12-18 months.

Conclusion: The degree of repigmentation achieved with topical tacrolimus and excimer lamp in a period of 4-6 weeks is much higher than other contemporary vitiligo therapies in children. This dual therapy of topical tacrolimus and 308 nm Excimer lamp is a safe and effective therapy showing an early response, for localized vitiligo in children.

Key words: 308 nm excimer lamp, childhood vitiligo, repigmentation, topical tacrolimus

INTRODUCTION

Vitiligo is a chronic, idiopathic acquired disorder which is characterized by progressive loss of melanocytes from the epidermis and the epidermal appendages. However successful treatment of vitiligo in all patients is still a mirage, although various combination modalities like topical steroids, immunomodulators, phototherapy and surgical therapies are commonly used. In the majority of

patients, it affects the psychosocial development and quality of life resulting in a low self-esteem. Global prevalence of vitiligo is 1-3%.^[1] In 50% of affected patients, the onset is below 20 years of age,^[2] further adding on to parental apprehensions and anxiety. Therefore, it is very important that childhood vitiligo is diagnosed and treated at the appropriate time.

Patients with vitiligo often present with abnormalities of both humoral and cell-mediated immunity. Tacrolimus, a topical immunomodulator, modulates the immune system by inhibiting T-cell activation through down regulation of the

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ADDRESS FOR CORRESPONDENCE

Dr. BS Chandrashekar,
#5/1, 4th Main Road, MRCR Layout, Near Veeresh Theatre Behind
Godrej Interio, Vijaynagar, Bengaluru - 560 040, Karnataka, India.
E-mail: cutisclinic@gmail.com

transcription genes encoding proinflammatory cytokines, namely interleukin (IL)-2, IL-3, IL-4, IL-5; interferon- γ ; tumor necrosis factor- α ; and granulocyte-macrophage colony-stimulating factor. Tacrolimus 0.1% is Food and Drug Administration approved for atopic dermatitis and is used off label for several other dermatologic conditions, such as vitiligo and psoriasis. Although the mechanism of action of tacrolimus has been elucidated, data describing how tacrolimus modulates the cutaneous milieu remain unknown.^[3]

The 308 nm excimer lamp generates single wavelength ultraviolet B (UVB) radiation with a spot size of 2 cm \times 2 cm and a pulse repetition rate up to 200 Hz. It has an adjustable exposure time. The 308-nm wavelength is particularly effective at inducing apoptosis of T-lymphocytes and stimulation of melanocyte migration and proliferation from the niche located in the hair follicles.^[4] It stabilizes the progression of the disease and induces an early repigmentation with face lesions responding the earliest and best.^[5]

A repigmentation rate of >75% in 20-60% of patients is achieved, depending on dosage and location of treatment. A major limitation to widespread use of 308-nm excimer lamp therapy is the difficulty in treating patients with a large body surface area (BSA), cost of treatment and equipment.^[4]

A combination of topical tacrolimus and excimer lamp is an effective modality to treat vitiligo in adults. However its efficacy in children is less explored.

AIM

To retrospectively assess the efficacy and tolerability of 308 nm Excimer lamp in combination with topical tacrolimus to treat vitiligo in children below 17 years with skin type III, IV and V.

METHODS

Case sheets and photographs of 47 vitiligo patches in 24 children (male = 9, female = 15), less than 17 years were included in the study. Data of patients with active disease and stable vitiligo, previously not treated were chosen for this study.

Treatment had started with one minimal erythema dose (equivalent to 150 mJ/cm²) and was increased

in a stepwise pattern by 100 mJ/cm² every sitting until redness had developed, in which case the dose was kept constant, reduced or skipped (if burning or blistering developed). Treatment was given thrice a week. A total of 20 sittings were completed. Topical tacrolimus was used for all patches on a daily basis during the therapy. The eyes were protected with UV protective glasses.

Photographs of 47 patches involving the face and neck, lips and scalp, trunk, limbs and extremities, which were taken at baseline, 2nd, 4th and 6th week of treatment, were evaluated for erythema and obtaining repigmentation scores. The repigmentation was graded on a 5 point scale, (0-4) assessed according to Table 1.

RESULTS

47 vitiligo patches in 24 children were evaluated for repigmentation on a 5 point scale (0-4) as shown in Table 1. Of the 47 patches 35 patches have shown repigmentation, accounting to 74.4% of the total patches. Figure 1 depicts the percentage of patches that have achieved 0-4 grades of repigmentation. Some of the patches began repigmentation as early as the 4th sitting itself [Figure 2 a and b] and achieving more repigmentation on further excimer sittings. All patches responded by the 12th week of the treatment except for the patches on palms, soles and scalp. The varied response of all vitiligo patches from different body sites, to excimer lamp is depicted in Figure 3 and Table 2.

Table 1: The grading repigmentation

Grades	Repigmentation (%)
0	0
1	1-25
2	26-50
3	51-75
4	76-100

Table 2: The repigmentation grades at different body sites after 20 sittings of excimer lamp therapy

Grade of repigmentation	Total (47)	Face and neck	Trunk	Limbs	Lips	Palms, soles, fingers and toes	Scalp
4	14	7	5	2	0	0	0
3	9	4	2	2	1	0	0
2	5	5	0	0	0	0	0
1	7	3	1	0	1	2	0
0	12	0	0	0	3	7	2
Average dose (mJ/cm ²)		500	900	1438	610	1361	1025

Seven out of 19 patches had 76-100% repigmentation (Grade 4), 4 patches showed a repigmentation of Grade 3. 5 patches had a 25-50% of repigmentation, i.e. Grade 2 and 3 patches showed Grade 1 improvement. All the patches in the facial region responded to the excimer lamp. Complete repigmentation of the periocular region is shown in Figure 4.

Five out of 8 patches had 76-100% repigmentation (Grade 4), 2 patches showed a repigmentation of Grade 3. 1 patch showed Grade 1 improvement. All the patches in the trunk region responded to the excimer lamp.

Out of 4 patches in the limbs, 2 patches showed Grade 3 repigmentation and two patches showed a repigmentation of Grade 4.

Out of nine patches in this region, only two patches showed Grade 1 repigmentation and the other 7 had no repigmentation at all.

The Lips and Scalp

Like the extremities, this area too showed comparatively poor response to excimer lamp treatment as shown in Figure 5. Out of 5 patches in the lips one had Grade 3 repigmentation and one patch showed Grade 1 repigmentation. Both the patches in the scalp showed no repigmentation. All the patients in our study retained the pigmentation during the 12-18 months follow-up period.

DISCUSSION

Of all the modalities available for treating vitiligo in children, phototherapy is the mainstay and is associated with varying rates of efficacy. NB-UVB

is helpful in patients who have >20% of BSA involvement. It requires regular sessions several times a week for about a year to achieve expected therapeutic response. Targeted 308 nm excimer monotherapy is an alternative therapy which actively controls the disease progression and also induces repigmentation in a short duration. In a study by Ostovari *et al.*, the effectiveness of the 308-nm excimer lamp treatment was not affected by patient age, suggesting that this modality may be useful in the pediatric population.^[6] Excimer lamp has the advantage of delivering high intensity radiation to the diseased skin, thus reducing the exposure of normal skin to radiation side effects.^[2]

Ostovari *et al.* and Taneja *et al.*'s studies found that UV sensitive areas achieved 75% repigmentation versus UV resistant areas showing 16% repigmentation.^[6,7] In our study all the 21 UV sensitive patches (face, neck and limbs) showed repigmentation, of which 15 patches (=71.4%) showed Grade 3 and 4 (>50%) repigmentation. Of the 16 UV resistant patches (lips, palms, soles, fingers and toes) 4 patches (=25%) showed repigmentation of Grade 3 and 1 [Figure 2].

Westerhof and Nieuweboer-Krobotova conducted a study with UVB 311-nm therapy in which 8% of patients achieved more than 75% repigmentation on 3 months treatment.^[8] Studies by Hofer *et al.* with excimer showed more than 75% repigmentation in 13% of patients with 30 treatment sessions.^[9] These data indicate that repigmentation is achieved within 30 treatment sessions. This is comparable to our study where a repigmentation response was noted as early as the fourth sitting, with increasing pigmentation on continuing treatment (74.4% repigmentation of 35/47 patches over 7 weeks treatment), with an average dose of 500 mJ/cm² in UV sensitive areas. However the UV resistant areas showed a minimal response with an average dose as high as 1400 mJ/cm². We could observe that if repigmentation did not begin by the 12th sitting then probably further sittings with excimer or alternate phototherapy are not beneficial.

When compared with excimer lamp monotherapy, topical tacrolimus with excimer lamp acts synergistically reducing the duration of clinical response.^[10,11]

Side-effects were noted in 6 patches (face, neck and lips) cautioning the slow increment in the dose of radiation during therapy. Erythema, peeling and burns were observed in 2 patches, [Figure 6] erythema alone was noticed in 4 patients. Peri-lesional hyperpigmentation

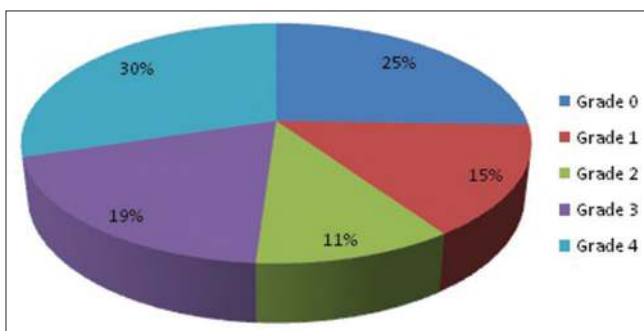


Figure 1: Pie chart depicting the overall repigmentation grades achieved in 20 sittings of excimer lamp therapy

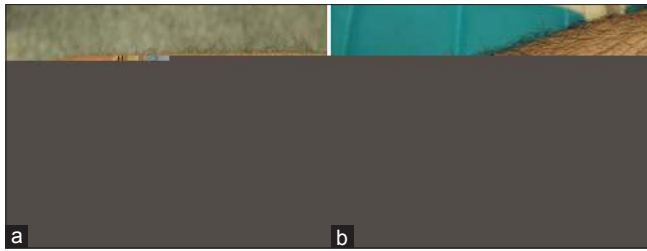


Figure 2a and b: Pictures before the excimer treatment and after 4th sitting depicting the start of repigmentation

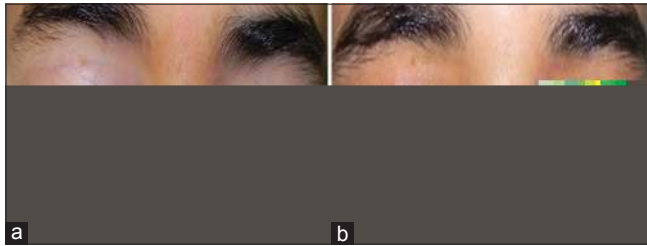


Figure 4a and b: Grade 4 repigmentation before the excimer treatment in 4a and after 20 sittings of the excimer treatment in 4b

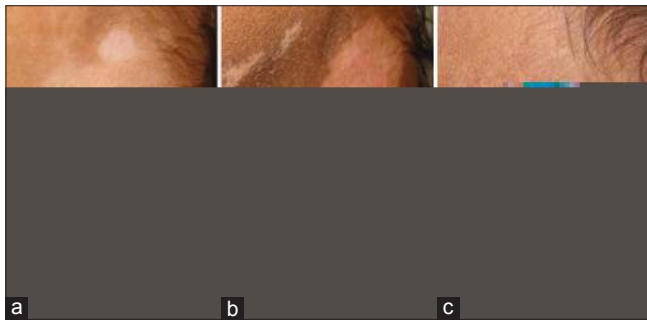


Figure 6a-c: Pictures before excimer therapy in 6a, 6b showing of erythema and burns following the 9th sitting. Grade 4 improvements was seen by the end of 15th sitting depicted in 6c

was noted in some patches which reduced following discontinuation of therapy.

However, further prospective studies with a larger study population and a control group can be conducted to study the effect of excimer therapy in children.

CONCLUSION

Since UV sensitive areas have shown 75-100% repigmentation, primarily children with vitiligo patches in UV sensitive areas can be considered for excimer therapy. Moreover, Excimer lamp is preferable in children as it prevents claustrophobia, which is otherwise experienced with NBUVB chamber.

For patches that don't respond to 20 sittings of excimer lamp, an alternate therapy should be



Figure 3: Bar chart showing grades of repigmentation at different sites following excimer lamp treatment

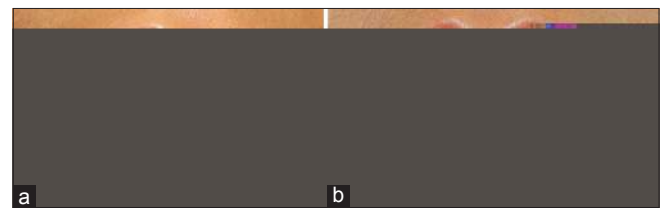


Figure 5a and b: Grade 0 repigmentation in the lips region before the excimer laser treatment 5a and after 20 sittings of the excimer treatment 5b

considered. Topical tacrolimus and excimer lamp act synergistically, thereby reducing the duration of clinical response.

308 nm excimer lamps can be safely used, with an effective and early response in childhood vitiligo, minimizing the exposure to radiation thus resulting in cosmetically satisfying results.

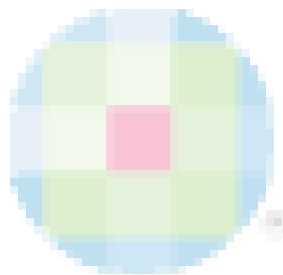
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