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Assessment of the Efficacy and Safety of Excimer Light in the Treatment of Vitiligo

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Abstract:

Background: Vitiligo is a chronic skin disorder characterized by patchy loss of skin color and affects approximately 0.5% to 2% of the world's population. Phototherapy has been used as the main treatment modality for patients with vitiligo. Different forms of phototherapy for vitiligo are present that include broad band ultraviolet B (BB-UVB), narrow band ultraviolet B (NB-UVB), excimer light and excimer laser, and Psoralen plus ultraviolet A (PUVA). Excimer Light was used and adapted for the treatment of vitiligo. The 308 nm wavelength delivered by either laser/lamp has shown satisfactory superiority to broad band (BB-UVB) and NB-UVB for clinically treating vitiligo.**The aim of the work** was to assess the efficacy and safety of excimer light in the treatment of vitiligo. **Patients and methods**: A total number of 14 vitiligo patients were included in the study. They were collected from Out-patient clinic of Dermatology, Venereology and Andrology department, Faculty of Medicine, Zagazig University. All the patients were subjected to complete history taking, complete general examination and clinical examination of vitiligo area. Then, all the patients received Excimer Lamp sessions twice weekly for 3 months. Any complications were recorded and patients were photographed before and after treatment to assess the clinical repigmentations.

Results: Efficacy of treatment by excimer light was 92.8%. The efficacy of treatment of facial and acral lesions was 100% whereas that of the body lesions was 83.3%. **Conclusion:** Excimer Light is effective and safe in the treatment of vitiligo.

Key words: vitiligo, Excimer light, phototherapy, repigmentation.

Introduction

Vitiligo is a cutaneous depigmentation disorder of multifactorial aetiology that affects 0.5–2% of the global population. Although commonly encountered in dermatological practice, it is not unusual to encounter recalcitrant and recurrent disease. Various treatments exist, including topical and systemic immunosuppressants, surgery, cosmetic camouflage and photochemotherapy [psoralen and ultraviolet (UV) A (PUVA)]. Conventional phototherapy is available as broadband UVB (BB-UVB) or the more

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commonly used vitiligo treatment, narrowband UVB (NB-UVB) [1]. Monochromatic excimer light (MEL, 308nm) utilizing the xenon-chloride (XeCl) gas combination has become the forerunner in the newest light technology used in dermatology. MEL is delivered by two main types of devices: the excimer laser, which delivers monochromatic coherent light that, is only targeted to affected skin; and the excimer lamp, which delivers incoherent nondirectional monochromatic light that can treat a more generalized affected area[2].Excimer devices employ a noble (rare) gas and a reactive (halogen) gas to form a complex ('exciplex') which in turn decomposes, emitting excess energy as UV radiation. The specific action spectrum of the excimer device is dependent on the gases utilized. In dermatology, the XeCl combination which emits the specific 308-nm wavelength is used exclusively [3].

The mechanism of action of MEL in vitiligo is unclear. Much like NB-UVB, MEL may promote repigmentation, stabilization and maintenance of disease through immunosuppression and immunomodulation. MEL is superior to both BB-UVB and NB-UVB phototherapy in induction of T-cell apoptosis, which may be a measure of the clinical efficacy [4].Repigmentation in vitiligo is incited by melanocytes through their migration, activation, and production of melanin. MEL upregulates the release of endothelin-1 from keratinocytes. In addition, MEL, like NB-UVB, may stimulate perifollicular dopa-depleted amelanotic melanocytes to produce melanin. This was supported in a head-to-head study of NB-UVB and the excimer laser, in which both modalities were found to induce a predominantly perifollicular repigmentation pattern, although the excimer laser to a greater extent than NB-UVB [5].The U.S. Food and Drug Administration has officially approved the excimer laser for the treatment of psoriasis, atopic dermatitis and vitiligo. The excimer laser has also been reported to be efficacious in the treatment of mycosis fungoides, prurigonodularis, localized scleroderma, genital lichen sclerosis and granuloma annulare, and its applications continue to expand as its use gains popularity [6].After the promising results with the excimer laser, the specific 308-nm wavelength was developed as the incoherent lamp. The excimer lamp is a polychromatic because it has a range of 306–310 nm with a peak at 308 nm, which makes up the majority of the light emitted [7]. There are also differences between the MEL devices. Both the laser and the lamp have a spot size that can be modified depending on the particular unit. The laser is selective, and is useful for focal disease. The lamp is advantageous for its flexibility in the range of body surface area that it can treat, from very confined areas up to the entire body.

MEL lamps were observed to take a longer time to deliver doses than comparable doses with the laser; this duration could be significant when higher doses are used and larger body surface areas are treated [8].The laser is more expensive to acquire and requires frequent maintenance (e.g. gas exchange), thus adding to operational costs. Lasers are generally over 100kg and are not easily mobile. The lamp requires minimal space and

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comes in more portable forms, including hand-held devices. These qualities may make the lamp more cost-effective and feasible for incorporating into practice [9]. Herein, wesaught to assess the efficacy of excimer light in the treatment of vitiligo.

Patients and methods

A total number of 14 vitiligo patients were included in the study. They were collected from Out-patient clinic of Dermatology, Venereology and Andrology department, Faculty of Medicine, Zagazig University in the period from December 2019 to January 2021. Inclusion criteria included: Newly diagnosed patients with localized Vitiligo of both sexes who didn't receive other treatment modalities for at least three months. Exclusion criteria included: pregnancy, lactation, renal or hepatic failure, present skin cancer or history of skin cancer, immunosuppressed patients, photosensitivity and bone marrow depression. All patients were subjected to the following: complete history taking and complete general examination. Clinical examination of vitiligo area and photodocumentation using a digital camera in 350 megapixels were done. After that, the study participants received Excimer lamp (Exciplex) sessions twice weekly for 3 months. Complications such as erythema, pain, ulceration, burning sensation, ecchymosis, infection, post inflammatory hyperpigmentation, and any allergic manifestations were recorded.

Patients were photographed before and after treatment and assessment of clinical repigmentations were made according to a 5-grade scale ranging from G0 to G4in which achieving at least 75% repigmentation of vitiliginous lesions was known as an 'excellent' result, or a score of 4 (out of 4). Repigmentation of 51–75% was a 'good' response, or a score of 3, and 25–50% repigmentation was a moderate response, or a score of 2[10]. The patients were followed-up monthly for 3 months after the end of the treatment sessions to detect any recurrence, complications or worsening of the lesions.

Ethical Considerations

This work has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans. Written informed consents were obtained from the study participants. Approval by IRB research committee of Zagazig Faculty of Medicine was also included.

Statistical Analysis

The data were coded, entered and processed on computer using Statistical package for social science (SPSS) (version 18).The results were represented in tabular and diagrammatic forms then interpreted. Mean, standard deviation, range, frequency, and percentage were used as descriptive statistics.

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Results

Table (1) illustrates the demographic data of the study participants. Mean age was 31.71 ± 16.79 and percentage of females (71.4%) was more than males (28.6%). 28.6% of patients have positive family history and 71.4% of the patients received previous treatments. Regarding the distribution of vitiligo lesions, 42.9% of patients have body lesions, 35.7% and 21.4% of patients have facial and acral lesions respectively as can be seen in table (2).

Table (1): Demographic characteristics of vitiligo patients

			Vitiligo patients
Age	**Range**		23-56
	Mean ± SD		38.07 ± 10.18
Sex	**Female**	**No.**	12
		%	85.7%
	Male	**No.**	2
		%	14.3%
Family history	**negative**	**No.**	9
		%	64.3%
	positive	**No.**	5
		%	35.7%
Duration	**<48 months**	**No.**	6
		%	42.9%
	> 48 months	**No.**	8
		%	57.1%
Previous treatment	**not received**	**No.**	3
		%	21.4%
	received	**No.**	11
		%	78.6%

Table (2): Distribution (facial, Acral and Body) of vitiligo lesion.

			Vitiligo patients
Site (facial)	**No**	**No.**	11
		%	78.6%
	Yes	**No.**	3
		%	21.4%
Site	**No**	**No.**	8

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(Acral)		**%**	57.1%
	Yes	**No.**	6
		%	42.9%
Site (Body)	**No**	**No.**	9
		%	64.3%
	Yes	**No.**	5
		%	35.7%

The efficacy of the treatment was 92.8%. This Efficacy of treatment was calculated regarding that any repigmatation of the vitiligo lesions starting from grade 1 to grade 4 was considered an effective treatment. In our study, grade 0 was (7.1%), grade 1 was (21.4%), grade 2 was (14.3%), grade 3 was (21.4%) and grade 4 was (35.7%).Figure (1) demonstrates the lesions before and after the treatment in grade (3) and Figure (2) shows the lesions before and after the treatment in grade (4).

Figure (1): vitiligo lesions before and after treatment with excimer light (grade 3).

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Figure (2): vitiligo lesions before and after treatment with excimer light (grade 4).

The efficacy of treatment of facial and acral lesions was 100% whereas that of the body lesions was 83.3% as demonstrated in table (3). Figure (3) illustrates the main side effects that were recorded.Hyperpigmentations and erythema have the highest percentages (64.3% and 50.0% respectively) whereas pain didn't occur in any of the study participants. Itching and dryness occurred equally (7.1%).

Table (3): Efficacy of the treatment in relation to site.

			Vitiligo patients
Efficacy of treatment	**Facial**	**No.**	5
		%	100%
	Acral	**No.**	3
		%	100%
	Body	**No.**	6
		%	83.3%

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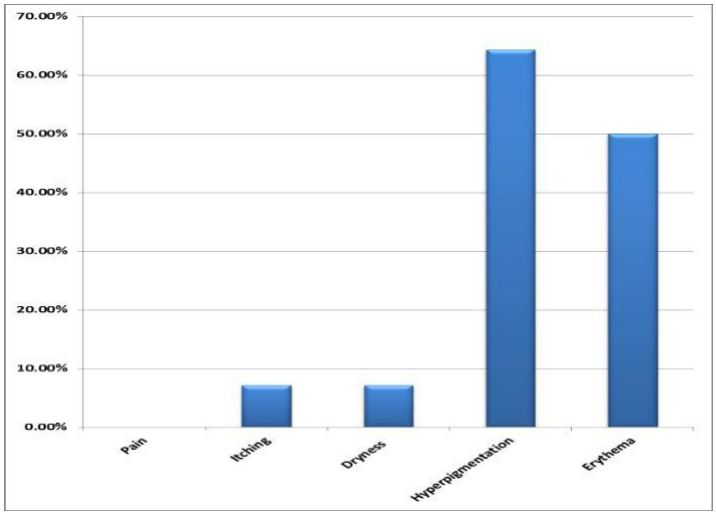

Figure (3): Side effects (pain, itching, dryness, hyperpigmentation and erythema) recorded after treatment with excimer light.

Discussion

Numerous therapeutic modalities had been recommended for vitiligo such as phototherapy, topical and systemic corticosteroids, calcineurin inhibitors, vitamin D3 analogue derivatives, 5-flurouracil, laser therapy, and surgical techniques. However, there is no treatment ensures complete cure of vitiligo.

Therefore, combination therapy is frequently recommended [11]. Excimer light helped to shorten the duration of therapy in small lesions of vitiligo. It has a wavelength of 308nm that emits 200 Hz short micro-impulses (60ns) that accumulate on the treated skin area to a macro-impulse of the desired fluence [12].The present work aimed to assess the efficacy and safety of excimer light in the treatment of vitiligo.Our study showed female predominance among the studied groups. This is in agreement with Zahra et al., (2020) who made interventional prospective study conducted from July 2018 to June 2019 on 60 vitiligo patients. They found a female predominance was observed in their study (62%) [13]. Another clinico-epidemiological study of vitiligo conducted by Handa and Dogra (2003) was also consistent with ours [14]. This probably reflects the increased social stigma of vitiligo in female patients, and thus early treatment-seeking behavior.Whereas, Lee et al., (2015) revealed males and females are equally affected, although women and girls often seek consultation more frequently, possibly due to the greater negative social impact than for men and boys [15].To our knowledge, this is the first study in Zagazig University that assessed the efficacy of treatment of excimer Light in treatment of vitiligo. Targeted phototherapy using 308-nm monochromatic excimer lamps or lasers is useful for the treatment of localized vitiligo.

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These devices deliver high-intensity light only to the affected areas while avoiding exposure of the healthy skin and lowering the cumulative UVB dose [16]. The efficacy of the treatment in our study was 92.8% which is in agreement with the previous findings of Deng et al., (2020) who investigated the effect of excimer light on vitiligo. A total of 60 patients with localized stable vitiligo who received treatment at Beijing Friendship Hospital and Xi'an Vitiligo Specialist Hospital. They found that, the effect of excimer light is significantly better [17].

Also, Salloum et al. (2020) published a meta-analysis study about the treatment efficacy of excimer light in vitiligo and they concluded that it is a safe, easy to use and effective therapeutic option for treatment of vitiligo [18]. Moreover, in Leone et al., (2003) study, over 95% of patients demonstrated some degree of repigmentation in the 4–8 weeks after treatment initiation andnearly 50% of their patients had over 75% repigmentation of their lesions at 12 weeks [19].A long-term study utilizing the lamp found that 29.7% of those with active vitiligo and 30.9% with stable disease had excellent results, with only a 2.6% relapse rate at 2-year follow-up [20].

There is no consensus on the standard measure of treatment efficacy in vitiligo. Excellent repigmentation rates varied from 12.5% to 61% of patches in various studies [10]. In our study, the percentage of patients who achieved excellent results (grade 4) was (35.7%) and those with good and moderate responses were 21.4% and 14.3%respectively. Those results was nearly similar to Cho et al. (2011) who madea retrospective study of vitiligo and found that the efficacy of excimer light in vitiligo wasexcellent was in 50%, moderate in 12% and good in 4% [21]. Moreover the efficacy of excimer laser in the facial and acral lesions was 100% and that of the body was 83.3%.This result is consistent with John et al., (2011) who found thatgreater than 75 %repigmentation of the facial vitiligo over a treatment course from 10 to 20 weeks [22].These body site-dependent response rates are alsoin agreement withother studies on the efficacy of excimer laser [23].Excimer light stimulates melanocytes to synthesize melanin in vivo; in the meantime, the light rapidly induces the apoptosis of infiltrating pathological T lymphocytes in skin lesions, thereby preventing melanocytes from being destroyed [24]. In our study, pain didn't occur in any of the study participants. Itching and dryness occurred at very low percentage which indicates that excimer light is safe for treatment of vitiligo and this is consistent with the previously reported study [18].

In conclusion, excimer light is safe and effective in the treatment of vitiligo.

Conflict of Interest: none

Financial Disclosures: none

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