Efficacy of 308-nm excimer laser in treating non-facial vitiligo lesions: a retrospective study in Iranian patients

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Background: Vitiligo is an autoimmune disorder characterized by depigmented patches, affecting 0.2-1.8% of the population. Effective treatments are essential due to the significant impact of the disease on patients' quality of life. The excimer laser, which emits UVB light at 308 nm, has shown promise in treating vitiligo, however its efficacy in non-facial lesions remains underexplored. This study investigates the response of Iranian patients with extra facial vitiligo to excimer laser treatment and identifies factors influencing clinical outcomes.

Methods: We conducted a retrospective study involving 50 patients treated at two dermatology centers in Tehran between 2023 and 2024. All patients had stable non-segmental vitiligo affecting non-facial areas. Treatment was administered assessed using a 308-nm excimer laser (MED-UV®). Clinical photography and physician-assessed improvement scores were used to evaluate outcomes. Statistical analyses included Student's t-test, ANOVA, and correlation coefficients.

Results: Overall treatment response varies by body location, with the neck and abdomen showing the greatest improvement, while the back, elbow, and knee exhibited the least response ($P < 0.001$). Factors such as gender, Fitzpatrick skin type, and age did not significantly affect the outcome. The number of treatment sessions positively influenced the response in the chest and elbow, and higher laser doses were associated with greater improvement in the neck, chest, and total lesions.

Conclusion: The 308-nm excimer laser is an effective treatment for non-facial vitiligo. Key factors influencing treatment efficacy include the laser dose and the number of treatment sessions, while demographic factors appear to have little impact. These insights can help optimize treatment plans for patients with vitiligo.

Keywords: vitiligo, lasers, laser therapy, treatment outcome, lasers, excimer

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What is already known on the subject?

- Prior studies have demonstrated the efficacy of 308-nm excimer laser therapy for vitiligo, showing results comparable to those of narrowband UVB phototherapy. The laser is known to induce repigmentation, particularly in cases of segmental vitiligo, however the response varies depending on the treatment area, skin type, and other demographic factors.

The study's main messages:

- This study provides detailed insights into the efficacy of excimer laser therapy for non-facial vitiligo in an Iranian population, highlighting the impact of body location and treatment parameters.
- The research highlights the importance of anatomical site variability, demonstrating that areas such as the back and elbows respond poorly to excimer laser treatment.

INTRODUCTION

Vitiligo is an acquired autoimmune- disorder characterized by depigmented patches with well-defined borders resulting from the loss of epidermal melanocytes. It affects approximately 0.2-1.8% of the general population, and its psychological impact on patients is significant [1]. The exact cause of vitiligo remains unclear, however the prevailing theory suggests an autoimmune mechanism supported by several factors. These include its association with other autoimmune disorders, the presence of antibodies against melanocytes in about 10% of vitiligo patients, genetic loci related to immunomodulatory proteins identified through genome-wide association studies, and the infiltration of inflammatory cells at the edges of active lesions. From a biochemical perspective, melanocyte damage is believed to result from oxidative stress imbalances, as evidenced by elevated hydrogen peroxide levels and increased superoxide dismutase activity in vitiligo patients. Another hypothesis, known as melanocytorrhagy, proposes that poor cell adhesion leads to the detachment and loss of melanocytes through the skin, exposing autoantigens and triggering an immune response that damages these cells. Finally, the convergence theory suggests that vitiligo development involves multiple factors, including genetic predisposition, susceptibility to environmental influences, alterations in the epidermal microenvironment, inherent melanocyte defects, and an autoimmune reaction [2]. According to recent guidelines for managing vitiligo, patients should be categorized based on their primary treatment needs: disease stabilization, repigmentation, or depigmentation of the remaining pigmented skin. Treatment options include medical, phototherapy, and surgical approaches to restore pigmentation in depigmented areas. Medical treatments encompass topical therapies such as corticosteroids, calcineurin inhibitors, and JAK inhibitors. Phototherapy options include narrowband UVB, or targeted wavelengths delivered via lasers, such as excimer [3].

The excimer laser and lamp were first introduced in 2002 for the repigmentation of vitiligo, emitting UVB light with a peak wavelength of 308 nm, which closely resembles the 311 nm peak of narrowband UVB (NB-UVB). Compared to NB-UVB, excimer devices demonstrate equal or greater effectiveness in treating vitiligo, often requiring shorter treatment durations and minimizing the risk of hyperpigmentation in unaffected skin. This therapy is primarily recommended for segmental vitiligo and other types affecting less than 10% of the body surface area (BSA) [4]. The safety of this treatment has recently been confirmed in a large cohort study [5].

In this study, we aimed to evaluate the potential of the 308-nm excimer laser for treating non-facial vitiligo lesions in Iranian patients and to assess the factors influencing the treatment response. The effectiveness of the excimer laser and the factors affecting response in the Iranian population have not been thoroughly investigated. By focusing on patients from Tehran, we sought to address this knowledge gap regarding the efficacy of this treatment modality, particularly considering the unique genetic, environmental, and cultural factors that may affect the disease's manifestation and progression. The results of this study could help clinicians better understand the determinants of successful excimer laser therapy and guide them in selecting the most appropriate treatment for vitiligo patients in Iran. Furthermore, the findings may provide valuable insights into regional variations in treatment response, thereby improving the management of vitiligo in diverse populations.

METHODS

Study Design and Participants

This retrospective study was conducted to evaluate

the efficacy of 308-nm excimer laser therapy in treating non-facial vitiligo lesions. The research was carried out between January 2023 and March 2024 at two dermatology centers in Tehran: Razi Dermatology Hospital, a tertiary care center, and Behsima Dermatology Clinic. Patient data were extracted from the electronic medical records of these institutions.

Inclusion and Exclusion Criteria

The study included 50 patients aged 18 years and older, who were diagnosed with stable non-segmental vitiligo, presenting with depigmented lesions in non-facial areas. Stability was defined as the absence of new lesions or enlargement of existing lesions in the past year. Diagnosis was confirmed using Wood's lamp examination. Patients undergoing excimer laser monotherapy were selected. Exclusion criteria included individuals with other depigmented disorders such as pityriasis alba, anemic nevi, post-inflammatory hypopigmentation, or tinea versicolor; those with active vitiligo exhibiting new or enlarging lesions within the past year; pregnant or lactating women; individuals with a history of photosensitivity disorders; patients who had received other forms of phototherapy or topical treatments within the preceding three months; and those with a history of keloid formation or hypertrophic scarring.

Laser Parameters and Treatment Protocol

Treatment was administered using a 308-nm Xenon-Chloride excimer laser (MED-UV®) from German Medical Engineering (GME). Sessions were scheduled three times weekly, starting with an initial pulse energy of 200 mJ. Energy was increased by 50 mJ every 1 to 3 sessions, tailored to the patient's skin type and response, up to a maximum of 2000 mJ. The total number of sessions was capped at 30; however, patients could discontinue earlier for personal reasons or based on clinical response.

Ethical Considerations

This study adhered to the ethical principles outlined in the Declaration of Helsinki and received approval from the Ethics Committee of Tehran University of Medical Sciences (Ethics code: IR.TUMS.MEDICINE.REC.1398.242). Due to the retrospective nature of the study, informed consent was waived. Patient confidentiality was maintained by anonymizing data prior to analysis, ensuring that no identifiable information was used. Access to the data was restricted exclusively to authorized research personnel.

Clinical Assessment

Patients were monitored throughout their treatment course. At each session, a dermatologist conducted a thorough examination, documenting clinical progress and capturing standardized photographs of the treated areas. Upon completion of the treatment regimen, an independent dermatologist evaluated treatment efficacy by comparing baseline and final photographs, assigning a percentage improvement score based on repigmentation. To enhance assessment accuracy, three additional dermatologists independently reviewed the images and provided their percentage improvement estimates. The mean of these evaluations was calculated for statistical analysis. Additionally, patient-reported outcomes regarding satisfaction and any adverse effects were recorded to provide a comprehensive evaluation of the treatment's impact.

Statistical Methods

Data analysis was performed using IBM SPSS Statistics (version 26; Armonk, NY, USA). Continuous variables are expressed as mean ± standard deviation and analyzed using Student's t-test or one-way ANOVA, as appropriate. Categorical variables are presented as frequencies and percentages, with comparisons performed using the chi-squared test or Fisher's exact test. A p-value < 0.05 was considered statistically significant.

RESULTS

A total of 50 patients with non-facial vitiligo who underwent excimer laser treatment were included in this study. Of these patients, 19 (38%) were male, and 31 (62%) were female. The mean age did not differ significantly between the two sexes ($P = 0.6549$). Regarding Fitzpatrick skin type, 19 patients (38%) were classified as Type IV, while 31 patients (62%) had Type III skin. No significant differences in treatment response were observed based on skin type. The average duration of vitiligo was 2.96 years (SD = 1.2), ranging from 1 to 6 years.

Treatment Response Across Body Locations

Table 1 summarizes the response rates to excimer

laser treatment across various body regions. The effectiveness of the therapy varied significantly depending on the anatomical site of the lesions ($P < 0.001$). The highest mean response rates were observed in the neck (mean ± SD: 24 ± 15) and the abdomen (17 ± 18), whereas the lowest responses were recorded in the back (3 ± 5), knees (4 ± 7), and elbows (4 ± 7). Body areas such as genitalia and buttocks showed no measurable response due to the low number of lesions treated in these regions (Table 1).

Pairwise comparisons of treatment responses between specific body regions, as shown in Table 2, provide detailed insights into the variability of treatment efficacy across anatomical sites. The results of a significant one-way ANOVA test ($P < 0.001$) indicate notable differences in mean improvement percentages among various regions. For example, a statistically significant difference was observed between the neck and hand, with the mean improvement percentage in the neck (24%) being significantly higher than that in the hand (9%) ($P < 0.001$). Similarly, other pairwise comparisons are comprehensively reported in Table 2. In contrast, no significant difference was observed between the abdomen and hand, with a p-value of 0.430. These findings underscore the importance of considering anatomical site variability when evaluating treatment outcomes (Table 2).

Influence of Age and Gender on Treatment Outcomes

The relationship between patient age and treatment response was examined and is illustrated in Figure 1. Statistical analysis revealed no significant correlation between age and treatment efficacy (Pearson correlation coefficient = 0.104, $P = 0.471$), indicating that age did not significantly influence the therapeutic outcomes (Figure 1).

The impact of gender on treatment response was also analyzed. As shown in Table 3, no significant differences in response rates were observed between male and female patients across the studied body locations ($P > 0.05$ for all comparisons). Additionally, treatment efficacy was not significantly different between Fitzpatrick skin types III and IV ($P > 0.05$ across all regions), indicating that skin type did not play a decisive role in determining the response to excimer laser therapy in this study (Table 3).

Correlation Between Treatment Parameters and Response

The relationship between the number of treatment

Table 1. Response rate to excimer laser treatment in various body regions.

Location	Number of Affected Patients	Mean Response Rate (%)	Response Rate SD (%)	Min Response Rate (%)	Max Response Rate (%)	*P*
Neck	29	24	15	0	50	
Hand	37	9	11	0	35	
Leg	18	6	8	0	20	
Abdomen	8	17	18	0	40	
Elbow	11	4	7	0	20	<0.001
Knee	9	4	7	0	20	
Back	7	3	5	0	10	
Chest	16	6	7	0	20	
Genitalia	1	0	-	0	0	-
Buttocks	1	0	-	0	0	-

Table 2. Comparative efficacy of excimer laser treatment across body regions.

	Neck	Hand	Leg	Abdomen	Elbow	Knee	Back
Hand	<0.001	-	-	-	-	-	-
Leg	<0.001	0.430	-	-	-	-	-
Abdomen	0.481	0.430	0.325	-	-	-	-
Elbow	<0.001	0.219	0.558	0.238	-	-	-
Knee	<0.001	0.339	0.737	0.269	0.831	-	-
Back	<0.001	0.134	0.430	0.219	0.831	0.712	-
Chest	<0.001	0.481	0.875	0.327	0.481	0.679	0.383

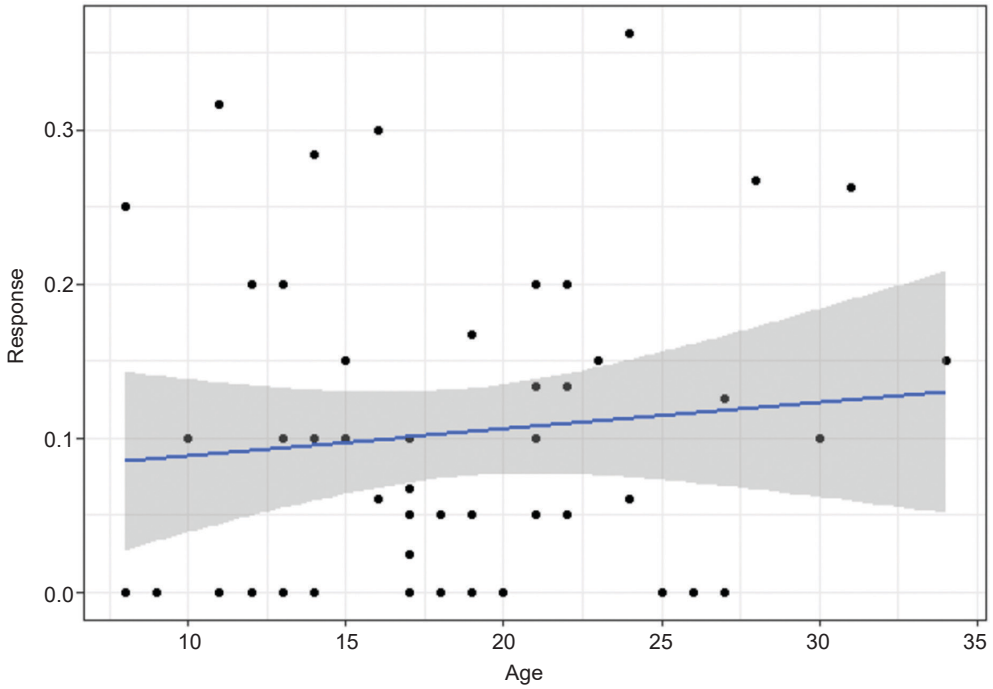

Figure 1. The relationship between patient age and treatment response.

sessions and response rates is detailed in Table 4. A significant positive correlation was observed for lesions on the chest (Pearson correlation = 0.718, $P = 0.002$) and the elbows (Pearson correlation coefficient = 0.715, $P = 0.013$). Similarly, the total number of sessions was significantly correlated with the overall average response rate (Pearson correlation coefficient = 0.287, $P = 0.043$).

The association between laser energy dose and treatment efficacy was also evaluated. A statistically significant correlation was identified for lesions on the neck (Pearson correlation = 0.377, $P = 0.044$), chest (Pearson correlation = 0.509, $P = 0.04$), and elbows (Pearson correlation = 0.719, $P = 0.013$). Additionally, the total dose of laser energy was likewise positively correlated with the overall response rate (Pearson correlation = 0.39, $P = 0.005$) (Table 4).

DISCUSSION

For a long time, PUVA and broad-band UVB phototherapy have been the primary treatments for vitiligo [6,7]. Recently, the 308-nm excimer laser has been introduced and has shown promising results in treating vitiligo [1,2,8-11]. The laser wavelength is close to that used in narrowband UVB, and presumably, the therapeutic effects are similar. For example, in 2016 a meta-analysis compared the excimer laser, excimer lamp, and NB-UVB finding no significant difference in efficacy among these treatment modalities [12]. This new modality allows higher doses to be delivered to specific lesion sites. At the same time, normal skin is protected from laser exposure because the laser energy is delivered through a flexible and precise handpiece. A 2023 systematic reviewhighlighted the advantages of the excimer laser in vitiligo compared to other surgical modalities, such as better control over the treatment area and avoidance of damage to normal skin [10].

The effectiveness of 308-nm excimer laser therapy is comparable to that of NB UVB phototherapy and is attributed to immunomodulatory mechanisms, including the induction and secretion of cytokines and T-cell-mediated apoptosis. Additionally, it is assumed that inactive melanocytes in the outer root sheath of the hair follicles are stimulated, promoting the differentiation of melanocyte stem cells, enhancing melanin production, and encouraging the proliferation and migration of melanocytes, which leads to repigmentation [13-17]. However, as previous studies have shown, its effectiveness can be variable, as vitiligo patches often respond incompletely to this laser treatment [1,2,8-11]. The use of excimer light in

Table 3. Comparison of gender and skin type impact on treatment outcomes.

Number of Affected Patients	Mean Response Rate (%)	*P*
Body Location		
Neck (29)		
Gender		
Male (11)	20 (16.7)	0.3414
Female (18)	25.8 (13.5)	
Fitzpatrick Skin Type		
3 (17)	27.3 (12.7)	0.127
4 (12)	18.3 (16.4)	
Hand (37)		
Gender		
Male (14)	10.3 (11.1)	0.51
Female (23)	7.8 (11.2)	
Fitzpatrick Skin Type		
3 (26)	7.692 (11.4)	0.355
4 (11)	11.364 (10.5)	
Leg (18)		
Gender		
Male (9)	6.6 (8.6)	0.67
Female (9)	5 (7.9)	
Fitzpatrick Skin Type		
3 (12)	5.417 (8.3)	0.767
4 (6)	6.667 (8.1)	
Abdomen (8)		
Gender		
Male (3)	13.3 (23.0)	0.73
Female (5)	19 (17.4)	
Fitzpatrick Skin Type		
3 (6)	15.833 (17.4)	0.871
4 (2)	20.000 (28.2)	
Elbow (11)		
Gender		
Male (4)	7.5 (9.5)	0.299
Female (7)	1.4 (3.7)	
Fitzpatrick Skin Type		
3 (5)	4.000 (8.9)	0.887
4 (6)	3.333 (5.1)	
Body Location		
Knee (9)		
Gender		
Male (4)	2.5 (5)	0.484
Female (5)	6 (8.9)	
Fitzpatrick Skin Type		
3 (3)	10.000 (10)	0.283
4 (6)	1.667 (4)	
Back (7)		
Gender		
Male (3)	6.6 (5.7)	0.1835
Female (4)	0 (0)	
Fitzpatrick Skin Type		
3 (4)	2.500 (5)	0.851
4 (3)	3.333 (5.7)	
Chest (16)		
Gender		
Male (5)	4 (5.4)	0.357
Female (11)	7.2 (7.8)	
Fitzpatrick Skin Type		
3 (10)	8.000 (7.8)	0.175
4 (6)	3.333 (5.1)	
Genitalia and Buttuck (2)		
Gender		
Male (1)	0 (0)	-
Female (1)	0 (0)	
Fitzpatrick Skin Type		
3 (1)	0.000 (0)	-
4 (1)	0.000 (0)	
Total (50)		
Gender		
Male (19)	9.3 (9.1)	0.59
Female (31)	10.9 (10.5)	
Fitzpatrick Skin Type		
3 (31)	11.417 (10.4)	0.31
4 (19)	8.539 (9.0)	

conjunction with immunosuppressive treatments is recommended, as this combination has demonstrated greater efficacy, achieving over 75% repigmentation when paired with topical tacrolimus [18]. It can also be used alongside other surgical methods, such as epidermal grafting, to enhance outcomes [19].

This study demonstrates that the 308-nm excimer laser is an effective treatment for depigmented patches in vitiligo, excluding the face, and investigates the contributing factors that influence treatment outcomes. The most commonly affected areas were the neck, hands, legs, abdomen, elbows, knees, back, chest, genitalia, and buttocks, listed in order of frequency. The neck exhibited the best response, followed by the abdomen, while the back, elbows, and knees showed the lowest responses. These findings aligns with prior research indicating that bony prominences and extremities are typically more resistant to treatment [9,20,21]. Notably, our study also identified the back as a particularly challenging region for excimer laser therapy.

Regarding gender and skin type, our results suggest that neither gender nor skin color significantly influenced the treatment response. There was no notable difference between male and female patients in terms of response across various body regions, which is consistent with previous studies [9,21]. However, it is

Table 4. Correlation between number of treatment sessions and laser dose with treatment response.

	Pearson Correlation	*P*
Neck		
Number of Sessions	0.308	0.105
Dose	0.377	0.044
Hand		
Number of Sessions	0.081	0.633
Dose	0.197	0.242
Leg		
Number of Sessions	0.004	0.987
Dose	-0.038	0.881
Abdomen		
Number of Sessions	0.212	0.615
Dose	0.615	0.105
Elbow		
Number of Sessions	0.715	0.013
Dose	0.719	0.013
Knee		
Number of Sessions	-0.104	0.791
Dose	0.177	0.648
Back		
Number of Sessions	-0.258	0.576
Dose	0.392	0.384
Chest		
Number of Sessions	0.718	0.002
Dose	0.509	0.04
Total		
Number of Sessions	0.287	0.043
Dose	0.39	0.005

important to note that our study sample was limited to Fitzpatrick skin types III and IV; therefore, further research including other skin types would be valuable.

Regarding age, we observed a significant difference only in the response from the elbow area, which may be due to the small sample size. Larger studies are needed to confirm this finding. Previous research has not consistently identified age as a factor influencing treatment outcomes [9,21].

An interesting finding in our study was the relationship between the number of treatment sessions and clinical response. While it might be expected that the response would correlate with the number of treatment sessions in all individual areas, we found that this correlation was present only in certain areas, such as the chest and elbow, as well as in overall improvement. In other specific areas, however, the number of sessions didn't have a significant impact. This supports findings from earlier studies, which have suggested that treatment success is often linked to the cumulative number of sessions [9,11,22].

Similarly, our study indicated that higher doses of excimer laser were associated with greater overall improvement, particularly in the neck, chest, and elbow regions. This finding is consistent with previous reports, which show that increased dosages generally lead to enhanced therapeutic responses [9].

Several factors that we were unable to measure in this study could also influence treatment outcomes, including the duration of vitiligo, the age at disease onset, family history, and the presence of comorbid conditions. These variables have been identified in other studies as potential contributors to treatment response [9,23].

COCNLUSION

In conclusion, the 308-nm excimer laser is a relatively safe and effective treatment modality for managing vitiligo in patients. The factors identified in this study- such as treatment area, number of sessions, and laser dosage- should be carefully considered by clinicians when selecting the most appropriate approach for each patient. While excimer laser therapy offers promising results, understanding the variables that influence treatment response can optimize outcomes and facilitate more individualized patient care.

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Author Contributions

A.H.E., P.N., I. E., and A.R. designed the research study. S. B. S., M.K.M., P. R. Sh. A., and A.E. collected the data. A.R., M.K.M., A. E., and F. L. analyzed and interpreted the data. S. B. S., A.E., F. L., and A.R. prepared the manuscript draft. A.R., A.H.E., I. E., and P.N. reviewed, edited, and approved the final manuscript. All authors have reviewed the manuscript and approved its submission.

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Data availability statement

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

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REFERENCES

1. Post NF, Ezekwe N, Narayan VS, et al. The use of lasers in vitiligo, an overview. J Eur Acad Dermatol Venereol. 2022;36(6):779-89.
2. Kubelis-López DE, Zapata-Salazar NA, Said-Fernández SL, et al. Updates and new medical treatments for vitiligo (Review). Exp Ther Med. 2021;22(2):797.
3. van Geel N, Speeckaert R, Taïeb A, et al. Worldwide expert recommendations for the diagnosis and management of vitiligo: Position statement from the International Vitiligo Task Force Part 1: towards a new management algorithm. J Eur Acad Dermatol Venereol. 2023;37(11):2173-84.
4. Esmat S, Hegazy RA, Shalaby S, et al. Phototherapy and combination therapies for vitiligo. Dermatol Clin. 2017;35(2):171-92.
5. Ju HJ, Han JH, Kim MS, et al. The long-term risk of lymphoma and skin cancer did not increase after topical calcineurin inhibitor use and phototherapy in a cohort of 25,694 patients with vitiligo. J Am Acad Dermatol. 2021;84(6):1619-27.
6. Westerhof W, Nieuweboer-Krobotova L. Treatment of vitiligo with UV-B radiation vs topical psoralen plus UV-A. Arch Dermatol. 1997;133(12):1525-8.
7. Köster W, Wiskemann A. Phototherapy with UV-B in vitiligo. Z Hautkr. 1990;65(11):1022-4, 9.
8. Baltás E, Csoma Z, Ignácz F, et al. Treatment of vitiligo with the 308-nm xenon chloride excimer laser. Arch Dermatol. 2002;138(12):1619-20.
9. Do JE, Shin JY, Kim DY, et al. The effect of 308nm excimer laser on segmental vitiligo: a retrospective study of 80 patients with segmental vitiligo. Photodermatol Photoimmunol Photomed. 2011;27(3):147-51.
10. Hartmann Schatloff D, Retamal Altbir C, Valenzuela F. The role of excimer light in dermatology: a review. An Bras Dermatol. 2024;99(6):887-94.
11. Hofer A, Hassan AS, Legat FJ, et al. Optimal weekly frequency of 308-nm excimer laser treatment in vitiligo patients. Br J Dermatol. 2005;152(5):981-5.
12. Lopes C, Trevisani VF, Melnik T. Efficacy and safety of 308-nm monochromatic excimer lamp versus Other phototherapy devices for vitiligo: a systematic review with meta-analysis. Am J Clin Dermatol. 2016;17(1):23-32.
13. Kuroda Y, Yang L, Lai S, et al. A lower irradiation dose of 308 nm monochromatic excimer light might be sufficient for vitiligo treatment: a novel insight gained from in vitro and in vivo analyses. Int J Mol Sci. 2021;22(19).
14. Kemp EH, Waterman EA, Weetman AP. Autoimmune aspects of vitiligo. Autoimmunity. 2001;34(1):65-77.
15. Cui J, Shen LY, Wang GC. Role of hair follicles in the repigmentation of vitiligo. J Invest Dermatol. 1991;97(3):410-6.
16. Yu HS. Melanocyte destruction and repigmentation in vitiligo: a model for nerve cell damage and regrowth. J Biomed Sci. 2002;9(6 Pt 2):564-73.
17. Goldberg DJ, Marmur ES, Schmults C, et al. Histologic and ultrastructural analysis of ultraviolet B laser and light source treatment of leukoderma in striae distensae. Dermatol Surg. 2005;31(4):385-7.
18. Nisticò S, Chiricozzi A, Saraceno R, et al. Vitiligo treatment with monochromatic excimer light and tacrolimus: results of an open randomized controlled study. Photomed Laser Surg. 2012;30(1):26-30.
19. Kato H, Toriyama K, Enomoto Y, et al. Excimer laser for the treatment of incomplete rerepigmentation 1 year after cultured epidermal autograft use for carbon dioxide laser-ablated lesions in patients with stable vitiligo. JAAD Case Rep. 2024;47:80-3.
20. Le Duff F, Fontas E, Giacchero D, et al. 308-nm excimer lamp vs. 308-nm excimer laser for treating vitiligo: a randomized study. Br J Dermatol. 2010;163(1):188-92.
21. Ostovari N, Passeron T, Zakaria W, et al. Treatment of vitiligo by 308-nm excimer laser: an evaluation of variables affecting treatment response. Lasers Surg Med. 2004;35(2):152-6.
22. Shen Z, Gao TW, Chen L, et al. Optimal frequency of treatment with the 308-nm excimer laser for vitiligo on the face and neck. Photomed Laser Surg. 2007;25(5):418-27.
23. Khalid M, Mujtaba G. Response of segmental vitiligo to 0.05% clobetasol propionate cream. Int J Dermatol. 1998;37(9):705-8.