

308nm Excimer Laser in Dermatology

Shadi Mehraban¹, Amir Feily²

¹Jahrom University of Medical Sciences, Jahrom, Iran

²Department of Dermatology, Jahrom University of Medical Sciences, Jahrom, Iran

Abstract:

308nm xenon-chloride excimer laser, a novel mode of phototherapy, is an ultraviolet B radiation system consisting of a noble gas and halide. The aim of this systematic review was to investigate the literature and summarize all the experiments, clinical trials and case reports on 308-nm excimer laser in dermatological disorders. 308-nm excimer laser has currently a verified efficacy in treating skin conditions such as vitiligo, psoriasis, atopic dermatitis, alopecia areata, allergic rhinitis, folliculitis, granuloma annulare, lichen planus, mycosis fungoides, palmoplantar pustulosis, pityriasis alba, CD30+ lymphoproliferative disorder, leukoderma, prurigo nodularis, localized scleroderma and genital lichen sclerosis. Although the 308-nm excimer laser appears to act as a promising treatment modality in dermatology, further large-scale studies should be undertaken in order to fully affirm its safety profile considering the potential risk, however minimal, of malignancy, it may impose.

Keywords: excimer; laser; dermatology

Please cite this article as follows:

Mehraban S, Feily A. 308nm Excimer Laser in Dermatology. *J Lasers Med Sci* 2014;5(1):8-12

Corresponding Author: Amir Feily, MD, Department of Dermatology, Honari Clinic, Motahari Street, Jahrom, Iran. Tel: +98-9177204638; Fax: +98-7913342010; Email: dr.feily@yahoo.com

Introduction

Excimer laser in which “excimer” is a terminological reference of “excited dimer”, composed of a noble gas and halide which repel each other, has turned into a prevalent mode of action in confronting numerous skin disorders¹. Of these ultraviolet B rays which comprise beams of varied wavelengths, the 308nm xenon-chloride is the most practical in dermatology¹. The advantages of monochromatic excimer laser over phototherapies of other kinds have been depicted as lower UV dose exposure, shorter course of therapy and for the most part, the possibility of being directed at distinct sites of skin rather than compromising the adjacent normal skin^{2,3,4}. The aim of this overview of excimer laser was to summarize all reported uses of this kind of laser in different dermatologic diseases.

Vitiligo

Vitiligo is an acquired depigmentary disorder

characterized by white areas on the skin due to loss of functional melanocytes^{5,6}. Medium doses of the 308-nm excimer laser has proved to be effective in the treatment of limited vitiligo, however, the rate and speed of repigmentation is highly associated with the site and duration of disease as the face and neck (UV sensitive areas) are the highly respondent areas along with an earlier resolution of the lesions while the joints and extremities (UV resistant areas) exhibit the slightest response to therapy⁷⁻¹⁰. Also, the shorter disease course is more promising in the treatment results¹¹. Additionally, trials have demonstrated further efficacy of treatment in Fitzpatrick skin types other than I and II^{12,13}. Combination therapy of the 308-nm excimer laser and calcineurin inhibitors, topical tacrolimus in particular, is regarded to be more beneficial than excimer laser alone^{14,15} as well as combination therapy with topical tacalcitol¹⁶. On the other hand, simultaneous use of topical calcipotriol has not indicated superior outcomes¹⁷. It has also demonstrated efficacy in treating

childhood vitiligo¹⁸ which is evidently intensified at simultaneous use of topical pimecrolimus¹⁹. Being compared to narrow-band UVB phototherapy (311-313 nm), 308-nm excimer laser seems to augment and expedite the repigmentation process^{20, 21}. Treatment outcomes of the 308-nm excimer lamp was akin to that of the 308-nm excimer laser^{22, 23}.

Psoriasis

Psoriasis is a common, chronic, disfiguring inflammatory and proliferative disorder of the skin^{24, 25}. Notable abrogation of psoriasis plaques has been noted even following the first session of excimer laser phototherapy which also sustains subsequent to treatment tapering^{26, 27}. It has shown to be efficacious in the management of psoriasis vulgaris, scalp and palmoplantar psoriasis²⁸⁻³¹ and child psoriasis as well³². Being administered with other modes of phototherapy (PUVA: psoralen UVA) or topical treatments (flumetasone, dithranol, calcipotriol; each applied in combination therapy individually), 308-nm excimer laser exhibited higher efficacy than monotherapy³³⁻³⁵. The 308-nm excimer lamp and the 308-nm excimer laser did not indicate any considerable differences in terms of efficacy³⁶.

Atopic dermatitis

Atopic dermatitis is a chronic relapsing skin disease characterized by xerosis and pruritus³⁷. 308-nm excimer laser should be considered as a beneficial treatment modality in localized atopic dermatitis both in adults and children³⁸⁻³⁹. It also appears to be more effective than clobetasol propionate in overcoming prurigo form of atopic dermatitis⁴⁰.

Alopecia areata

Both 308-nm excimer lamp and 308-nm excimer laser provoke regrowth of hair in patchy alopecia areata in children and adults, with the utmost effect on the scalp lesions in spite of no detectable changes in the lesions of extremities⁴¹⁻⁴⁴.

Allergic rhinitis

Regarding the immunosuppressive aspect of phototherapy, 308-nm excimer laser was appraised in the treatment of allergic rhinitis which evidently diminished the hypersensitivity symptoms such as rhinorrhea,

sneezing and total nasal score⁴⁵⁻⁴⁶.

Folliculitis

Substantial improvement was detected following sessions of 308-nm excimer laser therapy in refractory folliculitis⁴⁷.

Granuloma annulare

In a case report presenting a 73-year old female with long-standing granuloma annulare, thorough clearance of the lesions was obtained after undergoing sessions of 308-nm excimer laser therapy⁴⁸.

Lichen planus

Lichen planus is an inflammatory papulosquamous disorder of the skin⁴⁹. Significant resolution of erosive oral lichen planus was achieved on account of low-dose 308-nm excimer laser treatment^{50, 51}.

Mycosis fungoides

Receiving 308-nm excimer laser as a mode of therapy has shown promising results in early-stage localized mycosis fungoides^{52, 53}. Moreover, combination therapy of 308-nm excimer laser, psoralen ultraviolet A (PUVA) and oral bexarotene has set the stage for considerable remission of mycosis fungoides plaques in a case report⁵⁴.

Palmoplantar pustulosis

Application of 308-nm excimer laser brought about remission of palmoplantar pustulosis on top of increasing the levels of regulatory T cells⁵⁵.

Pityriasis Alba

Profound improvement of Pityriasis Alba was discerned following 308-nm excimer laser phototherapy with no significant adverse events⁵⁶.

CD30+ lymphoproliferative disorder

There is a case report of a primary CD30+ lymphoproliferative nodule in which profitable advancement was noted secondary to 308-nm excimer laser therapy⁵⁷.

Leukoderma

A case report presenting an HIV positive male who developed leukoderma of lower face due to amyl-nitrite exposure gained near-complete resolution of the lesions as a result of 308-nm excimer laser treatment ⁵⁸.

Prurigo nodularis, Localized scleroderma, Genital lichen sclerosis

Additionally, monochromatic excimer laser has been reported to contribute to marked improvement whilst confronting prurigo nodularis, localized scleroderma and genital lichen sclerosis ⁵⁹. To sum up, the 308-nm excimer laser should be considered a valuable treatment option when challenging diverse skin disorders both in terms of efficacy and safety; however larger investigations with long-term follow-up need to be conducted in order to thoroughly corroborate its use.

References

- Spencer JM, Hadi SM. The excimer lasers. *J Drugs Dermatol* 2004;3:522-5.
- Grema H, Raulin C. The excimer laser in dermatology and esthetic medicine. *Hautarzt* 2004;55:48-57.
- Mavilia L, Mori M, Rossi R, Campolmi P, Puglisi Guerra A, Lotti T. 308 nm monochromatic excimer light in dermatology: personal experience and review of the literature. *G Ital Dermatol Venereol* 2008;143:329-37.
- Morita A, Weiss M, Maeda A. Recent developments in phototherapy: treatment methods and devices. *Recent Pat Inflamm Allergy Drug Discov* 2008;2:105-8.
- Feily A, Baktash D, Mohebbipour A, Feily A. Potential advantages of simvastatin as a novel anti-vitiligo arsenal. *Eur Rev Med Pharmacol Sci* 2013;17:1982-3.
- Feily A, Pazyar N. Why vitiligo is associated with fewer risk of skin cancer?: providing a molecular mechanism. *Arch Dermatol Res* 2011;303:623-4.
- Wang HW, Zuo YG, Jin HZ, Liu YH, Ma DL, Jiang GT, et al. Efficacy and safety of 308 nm excimer laser for vitiligo. *Zhongguo Yi Xue Ke Xue Yuan Xue Bao* 2009;31:34-6.
- Shen Z, Gao TW, Chen L, Yang L, Wang YC, Sun LC, et al. Optimal frequency of treatment with the 308-nm excimer laser for vitiligo on the face and neck. *Photomed Laser Surg* 2007;25:418-27.
- Ostovari N, Passeron T, Zakaria W, Fontas E, Larouy JC, Blot JF, et al. Treatment of vitiligo by 308-nm excimer laser: an evaluation of variables affecting treatment response. *Lasers Surg Med* 2004;35:152-6.
- Hofer A, Hassan AS, Legat FJ, Kerl H, Wolf P. The efficacy of excimer laser (308 nm) for vitiligo at different body sites. *J Eur Acad Dermatol Venereol* 2006;20:558-64.
- Zhang XY, He YL, Dong J, Xu JZ, Wang J. Clinical efficacy of a 308 nm excimer laser in the treatment of vitiligo. *Photodermatol Photoimmunol Photomed* 2010;26(3):138-42.
- Hadi SM, Spencer JM, Lebwohl M. The use of the 308-nm excimer laser for the treatment of vitiligo. *Dermatol Surg* 2004;30:983-6.
- Al-Otaibi SR, Zadeh VB, Al-Abdulrazzaq AH, Tarrab SM, Al-Owaidi HA, Mahrous R, et al. Using a 308-nm excimer laser to treat vitiligo in Asians. *Acta Dermatovenerol Alp Panonica Adriat* 2009;18:13-9.
- Kawalek AZ, Spencer JM, Phelps RG. Combined excimer laser and topical tacrolimus for the treatment of vitiligo: a pilot study. *Dermatol Surg* 2004;30:130-5.
- Passeron T, Ostovari N, Zakaria W, Fontas E, Larrouy JC, Lacour JP, et al. Topical tacrolimus and the 308-nm excimer laser: a synergistic combination for the treatment of vitiligo. *Arch Dermatol* 2004;140:1065-9.
- Lu-yan T, Wen-wen F, Lei-hong X, Yi J, Zhi-zhong Z. Topical tacalcitol and 308-nm monochromatic excimer light: a synergistic combination for the treatment of vitiligo. *Photodermatol Photoimmunol Photomed* 2006;22:310-4.
- Goldinger SM, Dummer R, Schmid P, Burg G, Seifert B, Lächli S. Combination of 308-nm xenon chloride excimer laser and topical calcipotriol in vitiligo. *J Eur Acad Dermatol Venereol* 2007;21:504-8.
- Cho S, Zheng Z, Park YK, Roh MR. The 308-nm excimer laser: a promising device for the treatment of childhood vitiligo. *Photodermatol Photoimmunol Photomed* 2011;27:124-9.
- Hui-Lan Y, Xiao-Yan H, Jian-Yong F, Zong-Rong L. Combination of 308-nm excimer laser with topical pimecrolimus for the treatment of childhood vitiligo. *Pediatr Dermatol* 2009;26(3):354-6.
- Casacci M, Thomas P, Pacifico A, Bonnevalle A, Paro Vidolin A, Leone G. Comparison between 308-nm monochromatic excimer light and narrowband UVB phototherapy (311-313 nm) in the treatment of vitiligo--a multicentre controlled study. *J Eur Acad Dermatol Venereol* 2007;21:956-63.
- Hong SB, Park HH, Lee MH. Short-term effects of 308-nm xenon-chloride excimer laser and narrow-band ultraviolet B in the treatment of vitiligo: a comparative study. *J Korean Med Sci* 2005;20:273-8.
- Le Duff F, Fontas E, Giaccherio D, Sillard L, Lacour JP, Ortonne JP, 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.
- Shi Q, Li K, Fu J, Wang Y, Ma C, Li Q, et al. Comparison of the 308-nm excimer laser with the 308-nm excimer lamp in the treatment of vitiligo--a randomized bilateral comparison study. *Photodermatol Photoimmunol Photomed* 2013;29(1):27-33.
- Feily A, Pazyar N, Khazanee A, Ghassemi MR, Rafiee E, Safarpour M. Potential advantages of topical phenytoin as a novel anti psoriasis arsenal. *Niger J Med* 2011;20:296-7.
- Feily A, Namazi MR. Cissampelos sympodialis Eichl (Menispermaceae) leaf extract as a possible novel and safe

- treatment for psoriasis. *Sao Paulo Med J* 2009;127:241-2.
26. Asawanonda P, Anderson RR, Chang Y, Taylor CR. 308-nm excimer laser for the treatment of psoriasis: a dose-response study. *Arch Dermatol* 2000;136:619-24.
 27. Housman TS, Pearce DJ, Feldman SR. A maintenance protocol for psoriasis plaques cleared by the 308 nm excimer laser. *J Dermatolog Treat* 2004;15:94-7.
 28. Han L, Somani AK, Huang Q, Fang X, Jin Y, Xiang LH, Zheng ZZ. Evaluation of 308-nm monochromatic excimer light in the treatment of psoriasis vulgaris and palmoplantar psoriasis. *Photodermatol Photoimmunol Photomed* 2008;24:231-6.
 29. Goldinger SM, Dummer R, Schmid P, Prinz Vavricka M, Burg G, Lauchli S. Excimer laser versus narrow-band UVB (311 nm) in the treatment of psoriasis vulgaris. *Dermatology* 2006;213:134-9.
 30. Nisticò SP, Saraceno R, Stefanescu S, Chimenti S. A 308-nm monochromatic excimer light in the treatment of palmoplantar psoriasis. *J Eur Acad Dermatol Venereol* 2006;20:523-6.
 31. Taylor CR, Racette AL. A 308-nm excimer laser for the treatment of scalp psoriasis. *Lasers Surg Med* 2004;34:136-40.
 32. Pahlajani N, Katz BJ, Lozano AM, Murphy F, Gottlieb A. Comparison of the efficacy and safety of the 308 nm excimer laser for the treatment of localized psoriasis in adults and in children: a pilot study. *Pediatr Dermatol* 2005.
 33. Trott J, Gerber W, Hammes S, Ockenfels HM. The effectiveness of PUVA treatment in severe psoriasis is significantly increased by additional UV 308-nm excimer laser sessions. *Eur J Dermatol* 2008;18(1):55-60.
 34. Dong J, He Y, Zhang X, Wang Y, Tian Y, Wang J. Clinical efficacy of flumetasone/salicylic acid ointment combined with 308-nm excimer laser for treatment of psoriasis vulgaris. *Photodermatol Photoimmunol Photomed* 2012;28(3):133-6.
 35. Rogalski C, Grunewald S, Schetschorke M, Bodendorf MO, Kauer F, Simon JC, Paasch U. Treatment of plaque-type psoriasis with the 308 nm excimer laser in combination with dithranol or calcipotriol. *Int J Hyperthermia* 2012;28:184-90.
 36. Köllner K, Wimmershoff MB, Hintz C, Landthaler M, Hohenleutner U. Comparison of the 308-nm excimer laser and a 308-nm excimer lamp with 311-nm narrowband ultraviolet B in the treatment of psoriasis. *Br J Dermatol* 2005;152:750-4.
 37. Feily A, Namazi MR. Vitamin A + D ointment is not an appropriate emollient for atopic dermatitis. *Dermatitis* 2010;21:174-5.
 38. Nisticò SP, Saraceno R, Capriotti E, Felice CD, Chimenti S. Efficacy of monochromatic excimer light (308 nm) in the treatment of atopic dermatitis in adults and children. *Photomed Laser Surg* 2008;26:14-8.
 39. Baltás E, Csoma Z, Bodai L, Ignácz F, Dobozy A, Kemény L. Treatment of atopic dermatitis with the xenon chloride excimer laser. *J Eur Acad Dermatol Venereol* 2006;20:657-60.
 40. Brenninkmeijer EE, Spuls PI, Lindeboom R, van der Wal AC, Bos JD, Wolkerstorfer A. Excimer laser vs. clobetasol propionate 0.05% ointment in prurigo form of atopic dermatitis: a randomized controlled trial, a pilot. *Br J Dermatol* 2010;163:823-31.
 41. Ohtsuki A, Hasegawa T, Komiyama E, Takagi A, Kawasaki J, Ikeda S. 308-nm Excimer Lamp for the Treatment of Alopecia Areata: Clinical Trial on 16 Cases. *Indian J Dermatol* 2013;58:326.
 42. Al-Mutairi N. 308-nm excimer laser for the treatment of alopecia areata in children. *Pediatr Dermatol* 2009;26:547-50.
 43. Al-Mutairi N. 308-nm excimer laser for the treatment of alopecia areata. *Dermatol Surg* 2007;33:1483-7.
 44. Ohtsuki A, Hasegawa T, Ikeda S. Treatment of alopecia areata with 308-nm excimer lamp. *J Dermatol* 2010;37:1032-5.
 45. Kemény L, Koreck A. Ultraviolet light phototherapy for allergic rhinitis. *J Photochem Photobiol B* 2007;87:58-65.
 46. Csoma Z, Ignácz F, Bor Z, Szabo G, Bodai L, Dobozy A, et al. Intranasal irradiation with the xenon chloride ultraviolet B laser improves allergic rhinitis. *J Photochem Photobiol B* 2004 8;75:137-44.
 47. Nisticò SP, Saraceno R, Carboni I, Chimenti S. Treatment of folliculitis with monochromatic excimer light (308 nm). *Dermatology* 2009;218:33-6.
 48. Bronfenbrener R, Ragi J, Milgraum S. Granuloma annulare treated with excimer laser. *J Clin Aesthet Dermatol* 2012;5:43-5.
 49. Omidian M, Ayoobi A, Mapar MA, Feily A, Cheraghian B. Efficacy of sulfasalazine in the treatment of generalized lichen planus: randomized double-blinded clinical trial on 52 patients. *J Eur Acad Dermatol Venereol* 2010;24:1051-4.
 50. Trehan M, Taylor CR. Low-dose excimer 308-nm laser for the treatment of oral lichen planus. *Arch Dermatol* 2004;140:415-20.
 51. Köllner K, Wimmershoff M, Landthaler M, Hohenleutner U. Treatment of oral lichen planus with the 308-nm UVB excimer laser--early preliminary results in eight patients. *Lasers Surg Med* 2003;33:158-60.
 52. Nisticò S, Costanzo A, Saraceno R, Chimenti S. Efficacy of monochromatic excimer laser radiation (308 nm) in the treatment of early stage mycosis fungoides. *Br J Dermatol* 2004;151:877-9.
 53. Meisenheimer JL. Treatment of mycosis fungoides using a 308-nm excimer laser: two case studies. *Dermatol Online J* 2006;12(7):11.
 54. Huang J, Cowper S, Moss J, Girardi M. Case experience of 308-nm excimer laser therapy compatibility with PUVA and oral bexarotene for the treatment of cutaneous lesions in mycosis fungoides. *J Drugs Dermatol* 2013;12:487-9.
 55. Furuhashi T, Torii K, Kato H, Nishida E, Saito C, Morita A. Efficacy of excimer light therapy (308 nm) for palmoplantar pustulosis with the induction of circulating regulatory T cells. *Exp Dermatol* 2011;20:768-70.
 56. Al-Mutairi N, Hadad AA. Efficacy of 308-nm xenon chloride excimer laser in pityriasis alba. *Dermatol Surg* 2012;38:604-9.
 57. Meisenheimer JL. Novel use of 308-nm excimer laser to

- treat a primary cutaneous CD30+ lymphoproliferative nodule. *J Drugs Dermatol* 2007;6:440-2.
58. Vine K, Meulener M, Shieh S, Silverberg NB. Vitiliginous lesions induced by amyl nitrite exposure. *Cutis* 2013;91:129-36.
59. Nisticò SP, Saraceno R, Schipani C, Costanzo A, Chimenti S. Different applications of monochromatic excimer light in skin diseases. *Photomed Laser Surg* 2009;27:647-54.

Archive of SID