Therapeutic Modalities for Localized Psoriasis: 308-nm UVB Excimer Laser Versus Nontargeted Phototherapy

Tejaswi Mudigonda, BS; Tushar S. Dabade, MD; Cameron E. West, MD; Steven R. Feldman, MD, PhD

UVB phototherapy is an effective treatment modality for psoriasis. For patients with localized plaque-type lesions, 308-nm excimer laser phototherapy offers rapidly delivered, targeted, high UVB doses, while sparing adjacent healthy skin. We aimed to compare the advantages and disadvantages of the 308-nm xenon chloride (XeCl) UVB excimer laser with nontargeted broadband UVB (BB-UVB), narrowband UVB (NB-UVB), and psoralen plus UVA (PUVA) phototherapies. A PubMed search for studies evaluating the efficacy and safety of the laser versus nontargeted phototherapeutic modalities was conducted. Three prospective nonrandomized studies compared NB-UVB with excimer laser phototherapy. No head-to-head studies were found for BB-UVB or PUVA compared to excimer laser. Both the 308-nm excimer laser and nontargeted phototherapies were found to effectively clear localized psoriasis. Although it is proposed that excimer laser exclusively treats diseased skin with better response rates, split-body trials revealed no differences. Long-term studies are necessary to compare the effects of high-dose excimer laser regimens with nontargeted phototherapies.


Methods

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<th>Reference (Year)</th>
<th>Study Design</th>
<th>No. of Participants (Type of Psoriasis)</th>
<th>Treatment Regimen</th>
<th>Dose (^a)</th>
<th>Duration of Treatment</th>
<th>No. of Treatments</th>
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<tr>
<td>Bónis et al (^b) (1997)</td>
<td>Prospective, nonrandomized</td>
<td>10 (chronic plaque psoriasis)</td>
<td>Laser: 0.5 MED, then subsequent increase of 65 mJ/cm(^2) each session; NB-UVB: 130 mJ/cm(^2) with a 65 mJ/cm(^2) subsequent increase</td>
<td>Laser treatment was 2.27 (\times) shorter than NB-UVB</td>
<td>Mean no. of treatments for clearance was lower with laser (8.33 vs 30.1)</td>
<td>Laser: 4.81 J/cm(^2); NB-UVB: 31.1 J/cm(^2)</td>
<td>Lesions cleared in response to both treatments</td>
<td>Mild and transient hyperpigmentation on both treatment sides</td>
<td>Treatment of psoriatic lesions with excimer laser is more effective than NB-UVB treatment with respect to treatment duration, average no. of treatments, and cumulative dose</td>
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<td>Goldinger et al (^f) (2006)</td>
<td>Prospective, nonrandomized; right/ left comparative, open, single-blind</td>
<td>15 (psoriasis vulgaris)</td>
<td>Participants were administered 308-nm excimer laser on one side and 311-nm NB-UVB on the other side 3× weekly for 4 wk</td>
<td>Laser: 200 mJ/cm(^2) and increased by 100 mJ/cm(^2) each session; NB-UVB: 200 mJ/cm(^2) and increased by 50 mJ/cm(^2) each session</td>
<td>Total of 12 treatments for both modalities</td>
<td>N/A</td>
<td>Mean PASI reduction was 5.5 on excimer side and 4.9 on NB-UVB side; in 9 participants excimer laser yielded better results, in both treatment sides</td>
<td>Hyperpigmentation observed in 5 participants on both treatment sides</td>
<td>Both the excimer laser and NB-UVB are effective therapeutic options for psoriasis vulgaris management and the</td>
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<td>Goldinger et al&lt;sup&gt;6&lt;/sup&gt;</td>
<td>(2006) (continued)</td>
<td>4 participants NB-UVB showed better clearance, in 2 participants no difference between 2 sides was observed</td>
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<td>difference in efficacy is not significant</td>
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<td>Köllner et al&lt;sup&gt;7&lt;/sup&gt;</td>
<td>Prospective, nonrandomized</td>
<td>15 (plaque psoriasis)</td>
<td>3 different lesions were treated with 308-nm excimer laser, 308-nm excimer non-laser lamp, and 311-nm NB-UVB; each at 3 treatments per wk</td>
<td>Initial dose of 1 MED until clearing occurred every 2 sessions for laser, lamp, and NB-UVB</td>
<td>10 wk or until clearing</td>
<td>Mean no. of 24 treatments for each modality to yield clearance</td>
<td>Laser: 52.9 J/cm&lt;sup&gt;2&lt;/sup&gt;; lamp: 47.3 J/cm&lt;sup&gt;2&lt;/sup&gt;; NB-UVB: 64.9 J/cm&lt;sup&gt;2&lt;/sup&gt;</td>
<td>Mean PSI score reduction was 6.8 for laser, 6.5 for lamp, and 7.5 for NB-UVB; complete remission in 4 laser participants, 3 lamp participants, and 7 NB-UVB participants</td>
<td>Hyperpigmentation, crusting, blistering, and erythema were more common in laser therapy (6/15) than lamp (4/15) or NB-UVB (4/15)</td>
<td>All 3 modalities are equally advantageous in clearing psoriatic lesions</td>
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Abbreviations: NB-UVB, narrowband UVB; MED, minimal erythema dose; N/A, not available; PASI, psoriasis area and severity index; PSI, psoriasis severity index.

<sup>a</sup>UVB dose was reported either as joules per square centimeter or as multiples of the MED.
Phototherapy is one of the most efficacious treatment methods for inflammatory skin diseases, especially for patients with psoriasis. Targeted excimer phototherapy delivers monochromatic UV laser doses in short impulses and laser transmission through a handheld articulated arm, which is kept less than 1 cm from the psoriatic lesion.

In general, UV phototherapy works by changing immune cytotoxicity in the skin and by directly killing diseased cells by apoptosis. Zakarian et al reviewed multiple case studies that concerned the immunologic differences of cell death. These studies proposed that 308-nm excimer irradiance is more effective than broadband and narrowband modalities by reducing the keratinocyte proliferation in the intraepidermal layers of the skin and inducing T cell apoptosis. One study reported that the dose necessary to induce apoptosis in 50% of T lymphocytes is 95 mJ/cm² with the 308-nm excimer laser versus 320 mJ/cm² with NB-UVB phototherapy. These preliminary studies provide evidence for greater efficacy of laser phototherapy.
Our study compared the clinical efficacy of NB-UVB and the 308-nm excimer laser with respect to UV dose, clearance, remission times, number of treatments, and side effects. All 3 studies reported common side effects of hyperpigmentation and 1 of 3 studies also reported crusting, blistering, and erythema from both modalities. Statistically significant differences in side-effect profiles could not be drawn from the studies. Only 1 study reported greater efficacy of the excimer laser versus NB-UVB due to fewer number of treatments for clearance (8.33 vs 30.1), lower mean cumulative dose (4.81 vs 31.1 J/cm²), and lower duration of treatment. In the other 2 studies, the differences in efficacy and reduction in PASI⁹ and PSI⁷ scores for the 308-nm excimer laser versus NB-UVB were not significant. The only key limitation in the 2 studies was the use of a low-dose increment scheme for the excimer laser. Several studies have reported better clinical improvement with only a single administration of 8⁴ and 16⁶,¹⁵ MED excimer laser doses rather than lower doses. Although higher frequencies of blistering, erosions, and crusting are unavoidable, plaque clearance is possible in a short time and lasts for months when delivering high MED doses.¹³

Comparisons across large trials in which researchers administered 308-nm excimer laser and NB-UVB phototherapy provided contrasting results to our reviewed studies with respect to treatment outcomes. In one large multicenter trial of 124 participants treated with excimer laser, it was reported that 84% of participants had reached a PASI 75 after 10 or fewer treatments, 50% of participants reached a PASI 90 after 10 or fewer treatments, and 35% of participants reached a PASI 90 clearance in an average of 7.5 treatments.¹⁶ In contrast, a randomized observer-blinded trial of 113 participants reported that a mean of 24.4 total treatments yielded a clearance rate of 69% in 58 participants and a mean of 23 total treatments yielded a clearance rate of 80% in 55 participants treated 2 times weekly and 3 times weekly with NB-UVB, respectively.¹⁷ These studies suggest that the 308-nm UVB excimer laser offers several advantages over other available treatment modalities for psoriasis, particularly fewer treatments and the increased safety of site-specific dosing.

The use of creams and standard NB-UVB phototherapy is limited by hair and acts as a barrier to medication adherence and UV penetration. However, psoriatic plaques on the scalp respond to excimer laser in the same fashion as plaques elsewhere on the surface of the skin.¹⁸ The 308-nm UVB excimer laser offers the advantage to separate out the hair and treat precise areas on the affected scalp areas. In a small study involving 13 scalp psoriasis participants, half of each participant's scalp was treated with excimer laser and the other half was untreated. There was greater improvement on the treated side (P<.0001), which suggested that the excimer laser might be the better option compared with nontargeted modalities for scalp psoriasis.¹⁸

To date, there are no studies that compare the efficacy of 308-nm UVB excimer laser with BB-UVB or PUVA modalities. However, one study reported the effects of PUVA with 308-nm excimer light for plaque-type palmoplantar psoriasis.¹⁹ Ten participants with psoriasis of the palms and soles were randomly assigned to receive cream PUVA on one side and 308-nm UVB excimer laser treatment on the contralateral side. Both modalities showed similar improvement and clearance rates; however, the excimer light may lead to better compliance and a lower incidence of adverse effects because excimer therapy is not associated with prior drug application.¹⁹ Future studies could compare the efficacy of the excimer laser with BB-UVB and PUVA and assess if one modality is more clinically and cost effective.

**Conclusion**

By choosing to target localized lesions, excimer laser therapy offers the primary advantage over whole-body phototherapy to deliver UV only to specific body areas and lesions. Only 1 reviewed study concluded that the excimer laser is more efficacious in clearing psoriasis in fewer treatments and lower cumulative exposures when compared with NB-UVB phototherapy. Differences in adverse-effect profiles of excimer laser and NB-UVB phototherapy were not significantly different. Although targeted UVB excimer laser therapy is a safe and efficacious treatment modality for localized psoriasis, its value in psoriasis management compared to other UV phototherapy modalities should be further investigated.

**REFERENCES**


