

A randomized, investigator-blinded study to compare the efficacy and tolerance of a 650-microsecond, 1064-nm YAG laser to a 308-nm excimer laser for the treatment of mild-to-moderate psoriasis vulgaris

Mark S. Nestor, M.D., Ph.D.^{1,2}, Daniel Fischer, D.O., M.S.¹, David Arnold, D.O.¹, Haowei Han, D.O.¹, Anita Gade, D.O.¹, Francesca Ceci, M.D.¹, Austin Dunn, D.O.¹, Alec Lawson, B.A.¹

¹Center for Clinical and Cosmetic Research, ²University of Miami Miller School of Medicine

Background

Phototherapy is a safe and effective treatment option for psoriasis and does not incur the side effects of systemic medications.¹ The 308-nm excimer laser is considered first-line phototherapy for plaque psoriasis.¹ The excimer laser is able to treat psoriatic lesions with high doses of monochromatic radiation while sparing unaffected skin.¹ The 650-microsecond 1064-nm Nd: YAG laser was introduced in 2009 by Khatri and colleagues and is also FDA approved for the treatment of psoriasis. The advantage of the 650-microsecond laser is that treatment does not require cooling or anesthesia because the pulse duration is shorter than or equal to the thermal relaxation time of the therapeutic target. This feature minimizes scarring, pigmentary changes, thermal damage to surrounding tissues, and discomfort during or after treatment.²

Objective

The primary objective of this study was to compare the ability of the 650-microsecond, 1064-nm pulsed YAG laser (LightPod Neo®, Aerolase Corp., Tarrytown, NY) to clear psoriatic plaques with that of the 308-nm excimer laser (XTRAC Velocity 400®, PhotoMedex, Inc., Montgomeryville, PA).

Methods

Subjects: Eligible subjects (n=15) were healthy and included 11 males and 4 females aged 54.3 ± 11.7 (mean ± SD) years.

Study design: Psoriatic plaques were randomized to receive one of the two laser treatments. Laser therapy was administered with either the 650-microsecond laser on one side or the 308-nm excimer laser on the other side. A non-blinded individual treated each psoriatic plaque according to the randomization scheme. Subjects made up to 15 treatment visits, twice weekly or fewer if full clearance was achieved.

Treatment parameters: The 650-microsecond laser settings were the following: lens type 5 to 6 mm, energy mode 7 to 8, and pulse width 650 microseconds. Fluence ranged from 24 to 41 J/cm². Each subject received multiple passes per treatment session. For the excimer laser, median dose (fluence) ranged from 0.60 to 0.96 J/cm² and median body surface area treated ranged from 800 to 1410 cm². Multiple passes were not required.

Assessments: Measured outcomes include the Body Surface Area (BSA) involvement at baseline and the end-of-study visits, subject reported Itch by Numerical Rating Scale (NRS), the modified Psoriasis Area and Severity Index (mPASI) and Local Skin Reaction (LSR).

Results

Twelve subjects (80%) completed the study. One subject withdrew because of a change in work schedule that interfered with study visits. Two other subjects were lost to follow-up.

Body Surface Area: The median BSA at baseline (n=15) was 2.00, ranging from 2.0 to 4.0. At the end of the study (n=12), the median BSA was 2.25 and values ranged from 2.0 to 4.0. The median BSA at the end of study did not differ significantly from baseline.

mPASI scores: Differences between the 650-microsecond and excimer lasers were not significant for redness, thickness, scaliness, or mPASI scores. Overall mPASI scores for 650-microsecond vs. excimer lasers throughout the study period are shown in the Figure 1.

Local Skin Reactions: Median reaction scores were identical on both sides of the body. Median reaction scores were zero for each reaction parameter. Maximum values ranged from 0 to 2 for erosion/ulceration and erythema and from 0 to 3 for scaling.

Subject Reported Itch by Numerical Rating Scale: Median values were identical for both laser. Values varied from 2 to 4 during the initial visits and decreased to 2 by the end of the study. The median itch score at the end of the study was significantly lower than the baseline value (p = 0.0156).

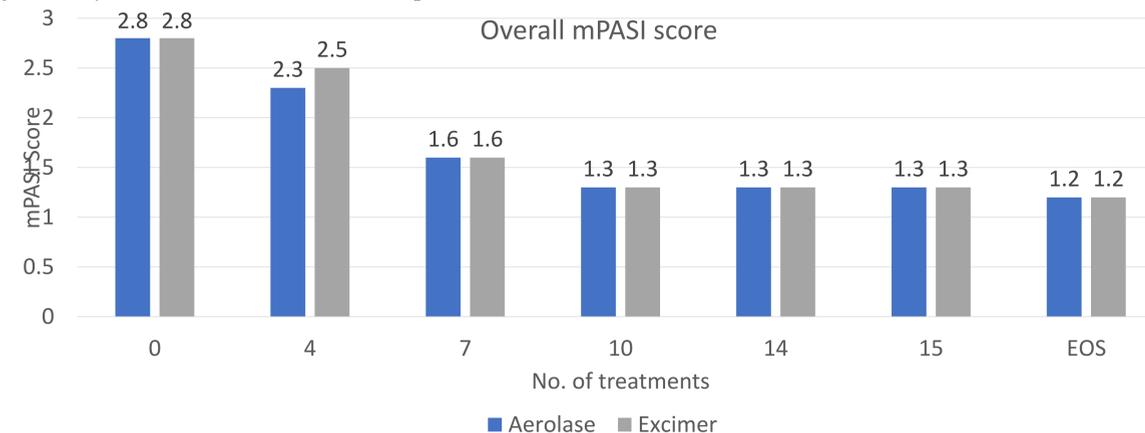


Figure 1. Overall mPASI scores for 650-microsecond vs. excimer lasers after the indicated treatments. EOS = end of study.



Figure 2. Left hand of a 60-year-old white male before (left) and after (right) 15 treatments (28 J/cm², multiple passes) with the 650-microsecond, 1064-nm pulsed YAG laser.

Discussion

The efficacy of the 650-microsecond laser has been shown to be equivalent to that of the excimer laser for the treatment of mild to moderate psoriasis vulgaris of the arms and legs (Figures 2, and 3). However the MOA is different as 650-microsecond laser energy deeply penetrates the plaque to target the excessive micro capillaries feeding plaque growth. Differences were not significant for redness, thickness, scaliness, mPASI scores for arms and legs, and overall mPASI scores. As shown in Figure 1, the median overall mPASI scores for both lasers were identical for all except treatment 4. As expected, the values decreased rapidly until visit 10 when they leveled off at 1.3 and decreased to 1.2 at the end of the study. Tolerance of both laser treatments was excellent. The 650-microsecond Nd:YAG 1064nm laser offers unique features not available in other devices. Since the pulse duration is shorter than the thermal relaxation time of both the skin and blood vessels, the therapeutic target is heated more rapidly than the rate heat is conducted to the surrounding skin, thus reducing damage and lowering the risk of pigmentary alterations.³ Additional advantage of the 650-microsecond laser is that it allows safe and effective treatment of other widespread skin conditions such as active acne³, onychomycosis⁴, rosacea², hyperpigmentation and LHR⁵ etc.



Figure 3. Left knee of a 65-year-old black male before (left) and after (right) 15 treatments (24 J/cm², multiple passes) with the 650-microsecond, 1064-nm pulsed YAG laser

Conclusion

The strength of the present study is its comparison with the excimer laser, the current first-line phototherapy for the treatment of mild-to-moderate psoriasis vulgaris. The efficacy and tolerance of the 650-microsecond laser has been shown to be equivalent to that of the excimer laser for the treatment of mild to moderate psoriasis vulgaris of the arms and legs and treatment-related adverse events were not observed. Limitations are the small number of patients and the short follow-up time. The encouraging results justify additional studies with more patients and longer follow-up time.

References

1. Zhang P, Wu MX. A clinical review of phototherapy for psoriasis. *Lasers Med Sci.* 2018;33:173-180.
2. Rose AE, Goldberg DJ. Successful treatment of facial telangiectasias using a micropulse 1,064-nm neodymium-doped yttrium aluminum garnet laser. *Dermatol Surg* 2013;39:1062-1066.
3. Gold MH, Goldberg DJ, Nestor MS. Current treatments of acne: Medications, lights, lasers, and a novel 650-µs 1064-nm Nd: YAG laser. *J Cosmet Dermatol.* 2017;16:303-318.
4. Hochman LG. Laser treatment of onychomycosis using a novel 0.65-millisecond pulsed Nd: YAG 1064-nm laser. *J Cosmet Laser Ther* 2011;13:2-5
5. Roberts WE, Henry M, Burgess C, et al. Laser treatment of skin of color for medical and aesthetic uses with a new 650-microsecond nd:yag 1064nm laser. *J Drugs Dermatol.* 2019;18:s135-s137