

# Clinical Evaluation of Hair Removal Using an 810 nm Diode Laser With a Novel Scanning Device

Erin Courtney RN BSN and David J. Goldberg MD JD  
Skin Laser & Surgery Specialists of NY and NJ, Hackensack, NJ

## ABSTRACT

**Introduction:** Diode lasers are often considered as the gold standard preference for hair removal due to the deep penetration and effective targeting of the hair follicle. A wide variety of diode lasers are available, which can differ in terms of their parameters (such as fluence, pulse duration, repetition rate, scanner, and cooling).

**Objective:** The objective of the study was to evaluate the safety and efficacy of hair removal with an 810 nm novel scanning diode laser, up to six months after last treatment.

**Methods:** A scanning 810 nm diode laser was used for axillary hair removal of 14 female patients who received 3 treatments, 4-6 weeks apart. Follow-up on hair count was conducted 3 and 6 months after last treatment and compared to baseline hair count.

**Results:** No unexpected or significant adverse events were recorded. An average hair count reduction of 72.8% after 3 months and 67.6% 6 months after the last treatment is demonstrated.

**Conclusions:** The examined 810 nm diode laser was proven to be safe and effective for hair removal. Results were sustained for 6 months after last treatment. Longer follow-up data are followed for further substantiation of the clinical effect. Scanning technology can provide for potentially faster and safer treatments.

*J Drugs Dermatol. 2016;15(11):1330-1333.*

## INTRODUCTION

Excessive hair growth and the growth of hair in anatomic areas that are not cosmetically desirable is a common aesthetic problem. Photo-epilation is a preferred mode for hair removal compared to the conventional methods such as waxing and needle epilation in terms of safety, clearance efficacy, time saving, and ease of use.<sup>1</sup> The lasers available to treat unwanted hair include the ruby laser (694 nm), the alexandrite laser (755 nm), the diode laser (800–810 nm), the Nd:YAG (neodymium-doped yttrium aluminum garnet) laser (1064 nm), and intense pulsed light (IPL; 590–1200 nm) devices.<sup>2</sup> Among the various photo-epilation technologies, the long pulse 810 nm diode laser has demonstrated the best results and has been preferred by patients in a comparative study.<sup>3,4</sup>

Diode lasers are the most popular preference for hair removal due to the deep penetration and targeting of the hair follicle. Often referred to as the gold standard in hair removal, the diode laser 810 nm wavelength is one that is highly reliable, has high papilla absorption, and can address a wide range of skin types, including skin types V and VI.

Numerous published studies evaluating long pulse 810 nm diode lasers<sup>5-8</sup> show long-term satisfactory hair clearance with comparable results. Other studies have also evaluated the variable parameters of diode lasers. Previous research has shown that high fluence, low repetition rate diode lasers, and low fluence, high repetition rate lasers present comparable short<sup>9</sup> and long-term

hair removal results.<sup>10,11</sup> The effect of an 810 nm diode laser with low fluence and long pulse duration, even without cooling, was examined and demonstrated to reduce pain and risks while maintaining clinical efficacy in long term hair removal.<sup>12</sup> However, the contribution of contact cooling to the safety of hair removal, along with the ability to use high fluence for efficacy, is also well established.<sup>13</sup> The use of a scanning mechanism in 800 nm diode laser handpiece can potentially speed up an effective hair removal treatment without the need for multiple passes.<sup>14</sup>

The objective of the current clinical study was to evaluate the safety and efficacy of hair removal using an 810 nm scanning diode laser. Short and medium-term follow-up results (3 and 6 months after last treatment) were assessed.

## MATERIALS AND METHODS

### The Device

An 810 nm laser using a scanning handpiece (Diolaze, InMode MD Ltd., Israel) was used in this study to determine hair reduction results. The laser has an 8 mm x 50 mm sapphire crystal that emits an 810 nm wavelength through scanning of short (30 ms) or long (80 ms) series of pulses and repetition rate that can be adjusted from single to auto-repeat (1-0.5 pps). The maximum fluence is 60 J/cm<sup>2</sup>.

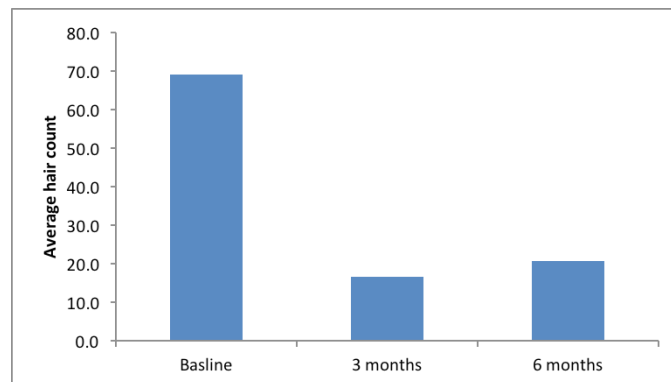
To increase patient comfort, the laser emission zone is surrounded by a plate that offers triple cooling during treatment. Such

**FIGURE 1.** InMode device with Diolaze scanning handpiece.

a handpiece provided pre-cooling, parallel cooling, and post-cooling. The continuous cooling ensures that topical anesthesia is rarely required during treatment. The laser's scanning cooling handpiece is shown in Figure 1.

### Study Design

14 subjects received 3 treatments, 4-6 weeks apart, with the Diolaze on the bilateral axillae, yielding 28 treatment zones. The

**FIGURE 2.** Graphic representation of average hair counts at baseline and at follow-up visits 3 and 6 months post-last treatment.

treatment's efficacy was evaluated at 2 follow-up visits, 3 and 6 months after last treatment, by calculating the percentage of hair reduction. Safety was evaluated after each treatment and at follow-up sessions. Any adverse event was documented.

Photographs were taken before each treatment session, and at follow-up visits. Hair counts were conducted on 2x2 cm stickers, with reproducible position.

### Efficacy and Safety Assessments

**Efficacy assessment:** Photographs and hair counts at 3 and 6 months post-last treatment session were compared to baseline photos to determine hair reduction efficacy.

**Safety assessment:** Safety assessment was completed after each treatment session and at each follow-up time visit. The parameters assessed included pain, excessive edema, excessive erythema, burn, localized infection, skin pigmentation, and textural alterations.

### Study Procedure

At visit 1, baseline data for patient screening was collected prior to the first treatment, and informed consent was obtained. Photographs of both axillae were taken before the session. The right and left axillae were both treated. After the treatment adverse events, if any, were recorded.

Treatment endpoints were assessed immediately following each treatment. Responses manifested as singed hair smell,

**TABLE 1.****Hair Count at Baseline and at Follow-up Visits 3 and 6 Months Post-Last Treatment and Percentage of Hair Reduction**

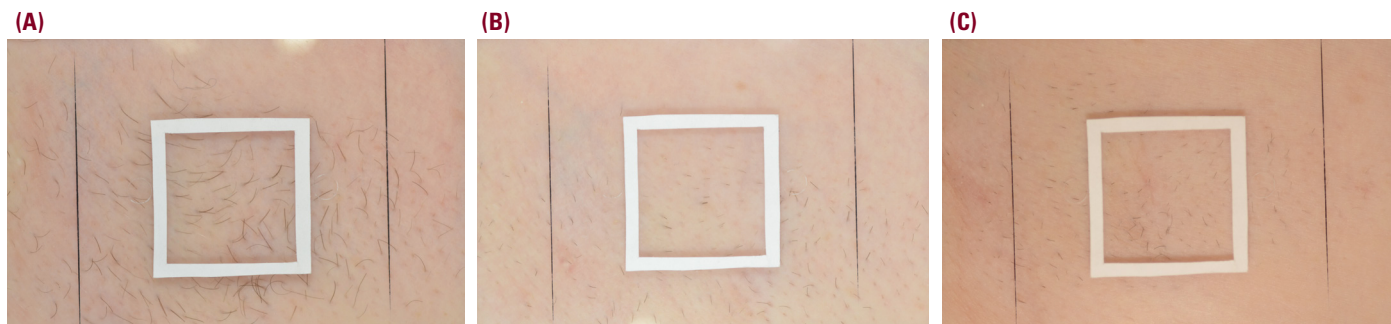
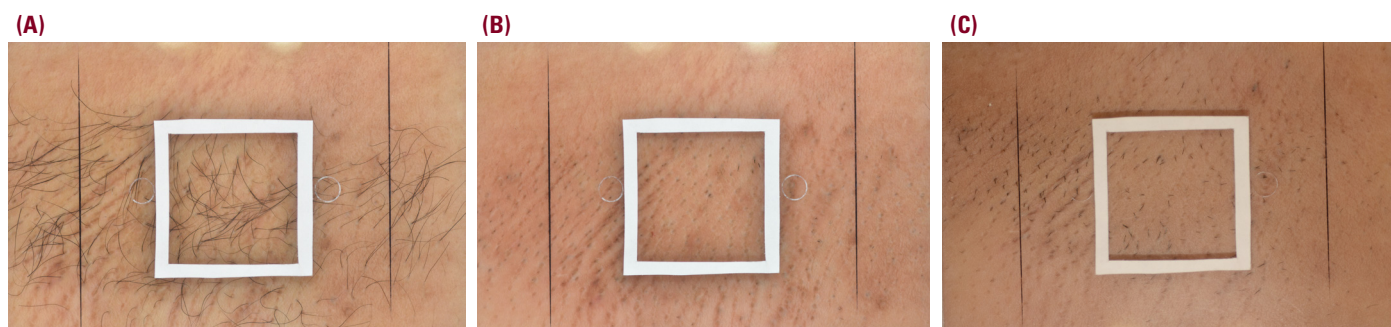
	Baseline Hair Count	3 months Hair Count	6 months Hair Count	% Reduction 3 months	% Reduction 6 months
Average	69.1	16.7	20.6	72.8	67.6
Standard Deviation	37.9	17.8	15.9	27.6	24.6
P-value		1.71E-07	2.06E-07		

© 2016-Journal of Drugs in Dermatology. All Rights Reserved.

This document contains proprietary information, images and marks of Journal of Drugs in Dermatology (JDD).

No reproduction or use of any portion of the contents of these materials may be made without the express written consent of JDD.

If you feel you have obtained this copy illegally, please contact JDD immediately at support@jddonline.com

**FIGURE 3.** Sample photos of left axilla of a selected patient at (A) baseline and at (B) 3 and (C) 6 months post-last laser treatment.**FIGURE 4.** Sample photos of right axilla of a selected patient at (A) baseline and at (B) 3 and (C) 6 months post-last laser treatment.

perifollicular erythema, and/or edema, and occasional lack of resistance to hair plucking.

In treatment visits 2 and 3, scheduled 4-6 weeks apart, photographs and adverse event recordings were performed and treatment was administered.

At 3 and 6 months post-last treatment, photographs and adverse event recordings were once again performed.

### Patient Selection

Inclusion criteria included adult female patients 18-70 years of age and Fitzpatrick skin type I – IV with brown/black terminal hair in the axillae. Subjects who participated in the study signed an informed consent form that had been approved by the Institutional Review Board and agreed to follow the treatment and follow-up schedule and post-treatment care.

Exclusion criteria included history of previous laser hair removal treatment in axilla, current or past history of skin cancer, severe concurrent medical conditions, pregnancy and nursing, impaired immune system, any active cutaneous eruption in the treatment area, keloids, and/or abnormal wound healing. Subjects with poorly controlled endocrine disorders, in particular PCOS, diseases that may be stimulated by light, and any surgery in the treated area within 3 months prior to

treatment, were also excluded. Additional exclusion criteria included use of medication known to induce photosensitivity, use of oral retinoids within 6 months prior to treatment, excessive exposure to sunlight or artificial UV light, and tattoo or permanent makeup on the area to be treated.

### Statistics

Statistical analysis of hair count differences was performed, comparing results before treatment to those at 3 and 6 months post-last treatment. Paired t-test was used and level of significance was calculated (*P* values).

## RESULTS

**Demographics:** 14 female patients aged 22-62 and Fitzpatrick skin type II – IV (of Caucasian, Hispanic, and Indian origin), with brown/black and coarse/fine terminal hair in the axillae, who were interested in axillary hair removal, were included in the study.

**Treatment parameters:** All subjects were treated at 30-40 J/cm<sup>2</sup> with a short pulse width of 30 ms. Cooling varied from 10°C for lighter skin to 2°C for darker skin. The scanning handpiece was used.

**Safety:** No unexpected or significant adverse events were recorded.

Expected immediate response included mild pain, mild erythema, and mild edema that subsided with no interference after a few hours.

No burn, localized infection, skin pigmentation, or textural alterations were recorded.

**Efficacy:** Table 1 and Figure 2 demonstrate hair counts of 28 treatment areas (left and right axillae of 14 patients) at baseline and at follow-up visits 3 and 6 months post-last treatment. An average hair count reduction of 72.8% after 3 months and 67.6% 6 months after the last treatment was demonstrated.

Figures 3 and 4 demonstrate sample photos of left and right axillae of two selected patients at baseline and at 3 and 6 months post-last laser treatment.

## DISCUSSION

Safety evaluation during the treatments and follow up visits indicated that this novel 810 nm scanning hair removal device is safe and no unexpected or significant adverse events occurred.

Study results indicated that ~70% hair reduction was achieved at 3 months after 3 treatments and nearly maintained at that level for an additional 3 months. Both reductions in hair count after 3 and 6 months were statistically significant ( $P<0.05$ ).

After 6 months, there was a slight decline in hair reduction comparing to 3 months. This may suggest that a maintenance treatment may be considered to sustain or even improve the percentage of hair reduction.

The parameters of treatment were established as effective and safe parameters. They include the combination of the wavelength (810 nm), with high fluence, short and effective pulse width, along with effective cooling. The large scanner size of 50 x 8 mm can speed up the treatment time while the scanner's cooling handpiece helps in decreasing discomfort, and increasing safety.

In summary, final results after 3-month follow-up show an average hair reduction of ~70% that was maintained after 6 months. No unexpected, prolonged, or significant adverse events were recorded.

## DISCLOSURES

InMode Inc., the manufacturer, has provided the device and funds for the study. Erin Courtney has no conflicts. Dr. Goldberg is a consultant and speaker for Invasix.

## REFERENCES

1. Haedersdal M, Wujf HC. Evidence-based review of hair removal using lasers and light sources. *J Eur Acad Dermatol Venereol*. 2006; 20(1):9-20.
2. Casey AS, Goldberg D. Guidelines for laser hair removal. *J Cosmet Laser Ther*. 2008; 1;10(1):24-33.
3. Sadighha, A meta-analysis of hair removal laser trials. *Lasers Med Sci*. 2009; 24(1): 21-25.
4. Rao J, Goldman MP. Prospective, comparative evaluation of three laser systems used individually and in combination for axillary hair removal. *Dermatol Surg*. 2005; 31(12):1671-1676.

5. Campos VB, Dierickx CC, Farinelli WA, et al. Hair removal with an 800-nm pulsed diode laser. *J Am Acad Dermatol*. 2000; 43:442-447.
6. Lou VVV, Quintana AT, Geronemus RG, Grossman MC. Prospective study of hair reduction by diode laser (800 nm) with long-term follow-up. *Dermatol Surg*. 2000; 26:428-432.
7. Sadick NS, Prieto VG. The use of a new diode laser for hair removal. *Dermatol Surg*. 2003; 29(1):30-33.
8. Fiskerstrand EJ, Svaasand LO, Nelson JS. Hair removal with long pulsed diode lasers: a comparison between two systems with different pulse structures. *Lasers Surg Med*. 2003; 32(5):399-404.
9. Pai GS, Bhat PS, Mallya H, Gold M. Safety and efficacy of low-fluence, high-repetition rate versus high-fluence, low-repetition rate 810-nm diode laser for permanent hair removal – a split-face comparison study. *J Cosmet Laser Ther*. 2011; 13(4):134-137.
10. Braun M. Comparison of high-fluence, single-pass diode laser to low-fluence, multiple-pass diode laser for laser hair reduction with 18 months of follow up. *J Drugs Dermatol*. 2011; 10(1):62-65.
11. Barolet D. Low fluence-high repetition rate diode laser hair removal 12-month evaluation: reducing pain and risks while keeping clinical efficacy. *Lasers Surg Med*. 2012; 44(4):277-281.
12. Koo B, Ball K, Tremaine AM, Zachary CB. A Comparison of Two 810 Diode Lasers for Hair Removal: Low Fluence, Multiple Pass Versus a High Fluence, Single Pass Technique. *Lasers Surg Med*. 2014; 46(4):270-274.
13. Klavun KG, Green D. Importance of cutaneous cooling during photothermal epilation: Theoretical and practical considerations. *Lasers Surg Med*. 2002; 31:97-105.
14. Baugh WP, Trafeli JP, Barnette DJ, Ross EV. Hair reduction using a scanning 800 nm diode laser. *Dermatol Surg*. 2001; 7(4):358-364.

## AUTHOR CORRESPONDENCE

**Erin Courtney RN BSN**

E-mail:..... erin@skinandlasers.com