

# Successful Treatment of Chickenpox Scars With Microdermabrasion and a Nonablative, Submillisecond, 1064-nm Nd:YAG Laser

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The use of lasers in patients with darker skin types presents a remarkable challenge to laser practitioners, especially when treating large areas of atrophic scarring following chickenpox infection. Treatment options often are limited because of an increased risk for pigmentary complications, including hypopigmentation and hyperpigmentation. This retrospective study evaluated the efficacy of a nonablative, submillisecond, 1064-nm Nd:YAG laser used in combination with microdermabrasion (MDA) therapy over 6 months to treat facial chickenpox scarring in 15 males with Fitzpatrick skin type IV or V. Participants were treated at a fluence of 14 to 16 J/cm<sup>2</sup> and a pulse duration of 0.4 milliseconds with a repetition rate of 5 Hz. Five to 6 laser treatments were performed on each participant every 3 to 4 weeks and 8 MDA treatments were performed 7 to 10 days apart. The mean follow-up time was 9.1 months after the final treatment session (range, 3–12 months). Both the participants and the treating physicians were asked to complete a questionnaire regarding changes in scarring and skin texture as well as postinflammatory hyperpigmentation (PIH) using a 4-point scale (2=marked improvement; 1=mild improvement; 0=no change; -1=worsening). Blinded assessments were performed by 3 independent physicians using before and after photographs (unlabeled) that were not arranged in chronologic order. Reviewers were instructed to identify the before and after photographs and evaluate the degree of improvement

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or worsening in scarring, skin texture, and PIH secondary to chickenpox infection. Clinically significant improvements in scarring, skin texture, and PIH were evaluated. Ultimately, data collected in this study suggest that a nonablative, submillisecond, 1064-nm Nd:YAG laser used in combination with MDA therapy is an effective treatment method for atrophic chickenpox scarring in patients with darker skin types, delivering clinically significant results with reduced risks for pigmentary complications and patient discomfort.

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**C**hickenpox, also known as varicella, is a highly contagious disease caused by the varicella-zoster virus. The disease rapidly spreads through direct contact with secretions from chickenpox vesicles as well as through the air when an infected person coughs or sneezes. Varicella remains contagious until all pustules crust over, and it is possible for a person who has never had chickenpox or been immunized against it to become infected simply by being in the same room as someone with the disease.<sup>1</sup>

Symptoms typically appear 10 to 21 days following initial exposure to the varicella-zoster virus and tend to be worse in adults compared to children.<sup>2</sup> Early symptoms of chickenpox may include body aches, fever, fatigue, and irritability. A characteristic papular rash of up to 500 itchy blisters eventually appears over the entire body, usually lasting 5 to 7 days and healing as scabs. The rash also can spread to the mouth or other internal parts of the body.<sup>2</sup> Patients who previously received the varicella vaccine may sometimes develop symptoms on exposure, but the presentation usually is mild, with a rash of only 50 or fewer red papules that rarely become vesicles.<sup>3,4</sup> Although chickenpox usually is self-limited, it can cause more serious complications in immunocompromised patients (eg, young children; older adults; patients with AIDS, lupus, or leukemia) such as secondary skin infections, pneumonia, and encephalitis.<sup>2</sup> Secondary bacterial infection of skin lesions manifesting as impetigo, cellulitis, or erysipelas is the most common complication in healthy children, with staphylococci and streptococci being the most commonly implicated bacterial pathogens. Bacterial superinfection often is a predisposition for chickenpox scarring.<sup>5-9</sup>

Chickenpox scars usually are more common in adults and scar treatment often represents a major challenge for cosmetic dermatologists, especially when dealing with patients with darker skin types because of the higher risk for pigmentary complications. This retrospective study evaluated the efficacy of a nonablative, submillisecond, 1064-nm Nd:YAG laser used in combination with

microdermabrasion (MDA) therapy over 6 months to treat facial chickenpox scarring in 15 males with Fitzpatrick skin type IV or V.

## METHODS

### Study Population

Patients presented to our clinic seeking treatment of facial chickenpox scars. The study included 15 males aged 35 to 48 years (mean, 42 years) with Fitzpatrick skin type IV or V who reported a history of chickenpox infection 3 months prior that resulted in numerous atrophic scars on the face and forehead. All participants reported the occurrence of skin lesions within 3 to 7 days of onset of fever, followed by scab formation that resulted in scarring within 10 days of initial appearance. Gentian violet lotion or topical antibiotic ointment was applied to the lesions and antibiotics were orally administered for 1 week. Participants received no other treatment prior to inclusion in the study. Exclusion criteria included any prior trial for treatment of the scars, any concomitant systemic disease or medications, and any active skin infection.

### Treatment Regimen

Treatment began with MDA therapy utilizing aluminum oxide crystals, followed by nonablative, submillisecond, 1064-nm Nd:YAG laser therapy. Microdermabrasion treatments were repeated every 7 to 10 days for 8 sessions and laser treatments were repeated every 3 to 4 weeks for 5 to 6 sessions. Microdermabrasion and laser treatments were performed a minimum of 3 days apart. Treatment was performed without topical anesthesia and no prophylactic therapy was administered before or after treatment to control postinflammatory hyperpigmentation (PIH) resulting from laser treatments. Treatment was performed over 6 months.

The parameters for all laser treatments included a 5-mm spot size, fluences of 14 to 16 J/cm<sup>2</sup>, and a pulse duration of 0.4 milliseconds with a repetition rate of 5 Hz. Treatment sites were divided into smaller areas measuring 5×5 cm. Laser pulses were delivered in a continuous motion while defocusing the handpiece 1 to 2 cm above the skin using multiple passes of the treatment area.

Participant Demographics<sup>a</sup>

| Participant No. | Age, y | Fitzpatrick Skin Type | No. of MDA Sessions | No. of Laser Sessions | Follow-up Period, mo |
|-----------------|--------|-----------------------|---------------------|-----------------------|----------------------|
| 1               | 45     | V                     | 8                   | 5                     | 10                   |
| 2               | 43     | IV                    | 8                   | 5                     | 3                    |
| 3               | 37     | V                     | 8                   | 6                     | 9                    |
| 4               | 47     | IV                    | 8                   | 6                     | 8                    |
| 5               | 36     | V                     | 8                   | 6                     | 12                   |
| 6               | 42     | V                     | 8                   | 6                     | 10                   |
| 7               | 41     | IV                    | 8                   | 6                     | 9                    |
| 8               | 48     | IV                    | 8                   | 6                     | 9                    |
| 9               | 35     | IV                    | 8                   | 6                     | 10                   |
| 10              | 44     | V                     | 8                   | 6                     | 12                   |
| 11              | 46     | V                     | 8                   | 6                     | 6                    |
| 12              | 39     | V                     | 8                   | 5                     | 8                    |
| 13              | 40     | V                     | 8                   | 5                     | 9                    |
| 14              | 44     | IV                    | 8                   | 6                     | 10                   |
| 15              | 43     | IV                    | 8                   | 6                     | 12                   |

Abbreviation: MDA, microdermabrasion.

<sup>a</sup>The mean age was 42 years; mean number of MDA sessions was 8; mean number of laser sessions was 5.7; and mean follow-up period was 9.1 months.

The handpiece was moved to an adjacent treatment area when erythema developed in the targeted area, typically after an average of 500 pulses per treatment square. Each session was conducted without cooling the skin before or after laser treatment.

Participants were followed for 3 to 12 months after the final laser session. There was no downtime after the procedure. Participants also were instructed to utilize

sunscreen with a sun protection factor of at least 30 in between sessions.

### Evaluations

A questionnaire was administered to all participants 4 weeks after the last laser session regarding changes in scarring and skin texture as well as PIH. These 3 parameters were graded on a 4-point scale (2=marked

## TREATMENT OF CHICKENPOX SCARS

improvement; 1=mild improvement; 0=no change; -1=worsening). The same questionnaire also was administered to the treating physicians to grade changes observed in each participant.

Photographs were taken before treatment and 3 months (or more) after the last laser session. Blinded assessments were performed by 3 independent physicians using before and after photographs (unlabeled) that were not arranged in chronologic order. Reviewers were asked to identify the before and after photographs and evaluate the degree of improvement or worsening observed in scarring, skin texture, and PIH using a 4-point scale (2=marked improvement; 1=mild improvement; 0=no change; -1=worsening). No statistical analysis was performed.

Adverse effects were evaluated immediately after each laser treatment and 2 and 4 weeks after each laser session.

## RESULTS

All 15 participants were included in the analysis (Table). The mean length of follow-up after the final laser session was 9.1 months. Questionnaire results demonstrated marked improvement in scarring, skin texture, and PIH as observed by participant and physician evaluation (Figures 1 and 2). Results of the participant assessment revealed mean scores in scarring, skin texture, and PIH of 1.8, 1.9, and 1.8, respectively. Physician evaluation of improvement revealed mean scores of 1.9, 1.9, and



**Figure 1.** Participant with chickenpox scarring at baseline (A and C) and following 5 sessions of laser treatments and 8 sessions of microdermabrasion (B and D).



**Figure 2.** Participant with chickenpox scarring at baseline (A) and following 5 sessions of laser treatments and 8 sessions of microdermabrasion (B).

1.8, respectively (2=marked improvement; 1=mild improvement). Participant and physician evaluation did not reveal scores of no change or worsening for the 3 parameters.

For the blinded photographic assessments, all 3 reviewers correctly identified the chronology of 13 participant photographs (13/15). Of the 90 possible photograph reviews for each category (15 before and 15 after photographs reviewed by 3 physicians), 2 were determined by 1 reviewer as insufficient quality to judge before and after photographs. Additionally, 4 photographs were excluded from skin texture analysis and 5 were excluded from PIH analysis. Photographs were excluded due to insufficient focus, color balance, and/or lighting. The results of the blinded photographic assessments indicated clinically significant improvements in scarring, skin texture, and PIH, with mean scores (based on all 3 reviewers) of 1.9, 1.8, and 1.8, respectively (2=marked improvement; 1=mild improvement). None of the reviewers scored these parameters as no change or worsening.

Transient mild edema and erythema were observed in all participants and resolved within a maximum of 2 hours

after treatment. No transient or permanent complications such as blistering, crusting, purpura, scarring, or transient or permanent hyperpigmentation or hypopigmentation were noted at 2 or 4 weeks. None of the participants reported any adverse effects during or after the treatment sessions through the end of the follow-up period.

### COMMENT

The use of lasers to treat atrophic scarring in darker skin types presents a remarkable challenge to laser practitioners. Current treatment modalities, including deep dermal peels, ablative and nonablative fractional laser resurfacing, and surgical techniques, are not widely available to patients with Fitzpatrick skin types IV to VI because of increased risks for pigmentary complications. These complications are particularly likely when treating large areas of facial scarring, including scars following chickenpox infection.

The procedure evaluated in this study combined MDA and laser therapy to optimize results of atrophic scar treatment in darker skin types. Microdermabrasion was included to improve the structure of the epidermis by

decreasing the population of keratinocytes and stimulating the proliferation of the living cell layer, microcirculation, and lymphatic drainage.<sup>10-12</sup> The laser treatments were intended to induce sustained volumetric heating by increasing the temperature of the dermis to approximately 40°C and maintaining it for a minimum of 2 minutes. The goal of the sustained volumetric heating of the dermis was to initiate a mild inflammatory reaction leading to the deposition of fibroblasts followed by the synthesis of new collagen in the treated area.<sup>13-15</sup>

Ultimately, data collected in this study suggest that a nonablative, submillisecond, 1064-nm Nd:YAG laser used in combination with MDA is an effective treatment method for atrophic chickenpox scarring in patients with darker skin types, delivering clinically significant results with reduced risks for pigmentary complications and patient discomfort.

It is noteworthy that existing PIH improved in all participants following the procedure; it also is clinically significant that the laser treatment did not induce additional PIH or require anesthetics or additional treatment agents before and after therapy sessions to control PIH. The treatment modality evaluated in this study may offer a new standard of care and first-line treatment option for patients with atrophic scarring and a high risk for pigmentary complications.

### CONCLUSION

The combination of MDA therapy and nonablative, submillisecond, 1064-nm Nd:YAG laser treatment is an effective treatment modality for chickenpox scarring and PIH in darker skin types.

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### Quick Poll Question

What laser would you use for acne scars?

- A. CO<sub>2</sub> laser
- B. Er:YAG laser
- C. Fractional photothermolysis
- D. Q-switched Nd:YAG laser

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