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Acne Vulgaris Successfully Treated with Long-Pulsed 1,064-nm Neodymium:Yttrium-Aluminum-Garnet Laser

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Acne vulgaris is a chronic skin disease of pilosebaceous units with multifactorial pathogenesis that affects about 80% of adolescents and young adults. Although various treatment modalities for acne are reported, treatment of acne with minimal side effects is challenging. In this report, we treated a patient with acne vulgaris using long-pulsed 1,064-nm neodymium:yttrium-aluminum-garnet (Nd:YAG) lasers. After two sessions of long-pulsed 1,064-nm Nd:YAG laser treatment, the patient presented with nearly complete improvement with no remarkable side effects or recurrence over the duration of 6 months. We suggest that long-pulsed 1,064-nm Nd:YAG laser can be effectively and safely used to treat inflammatory lesions in the skin, particularly acne vulgaris, in Asian patients.

Key words

Acne vulgaris; Long-pulsed 1,064 nm; Neodymium:yttrium-aluminum-garnet laser

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INTRODUCTION

Acne vulgaris is one of the most common chronic skin diseases of pilosebaceous units resulting from androgen-induced increased sebum production, altered keratinization, inflammation, and bacterial colonization of hair follicles on the face, neck, chest, and back by *Propionibacterium acnes*.¹ It affects approximately 80% of adolescents and young adults.² Acne pathogenesis is generally associated with excessive follicular keratinization, androgen related hyperplasia of the sebaceous glands and increased sebum, colonization with *Propionibacterium acnes* and inflammatory response including expression of protease-activated receptor-2 leading to epidermal barrier disruption.³

Among various treatment modalities for acne vulgaris, lasers may be a good alternative therapeutic options for those patients who fail to respond to or could not tolerate other acne treatments. Various reports of treatment modalities using in patients of acne vulgaris with different light sources, has been detected recently.^{1,2} Nevertheless, the anti-acne mechanisms associated with some lasers including remain largely unknown and need to be elucidated.

Herein, we report a case of acne vulgaris using long-pulsed 1,064-nm neodymium:yttrium-aluminum-garnet (Nd:YAG) lasers. After monthly two sessions of long-pulsed 1,064-nm Nd:YAG laser treatment, the patient presented nearly complete improvement in the lesions

with no remarkable side effects or recurrence over the duration of 6 months.

CASE REPORT

A 19-year-old, Korean woman visited our clinic with multiple erythematous papules with pustules on the face and neck (Fig. 1). The patient was clinically diagnosed with acne vulgaris (Fig. 1A, 1C) and was scheduled to undergo laser treatment. After obtaining written informed consent, the patient was treated with 2 sessions monthly of long-pulsed 1,064-nm Nd:YAG laser treatment (GentleYAG™; Syneron-Candela Inc., Irvine, CA, USA) and was performed at the combination treatment with painting motion technique (10-mm spot size, 13 J/cm² fluence with 0.3 milliseconds (ms) of exposure time), and a 10 mm spot size, 30 J/cm² fluence with 30 ms of exposure time, and a total of approximately 200 shots on the skin lesion.⁴ The treated areas were cooled with dynamic cooling device (DCD) spray (pre 30 ms post 30 ms delay 30 ms), and no prophylactic systemic or topical corticosteroids were prescribed. The patient was recommended to apply nadifloxacin cream and moisturizers. At 6 months after the first treatment of long-pulsed 1,064-nm Nd:YAG laser treatment, the patient presented nearly complete improvement of the acne lesions without worsening or recurrence (Fig. 1B, 1D). After the treatment, the patient also wanted to treat of folliculitis on her chest. The same treatment session was performed and the lesion on her

Fig. 1. Photographs of a 19-year-old, Korean female with acne vulgaris (A, C) at baseline, (B, D) after 2 sessions of long-pulsed 1,064-nm neodymium:yttrium-aluminum-garnet laser treatment (6 months after baseline).

chest also presented nearly complete improvement (data not shown).

DISCUSSION

Laser treatments using various wavelengths were regarded in response to a need of alternative treatment options for acne. They are based on two mechanisms of action; destruction of *P. acnes* and sebaceous glands. Photodynamic therapy with blue to red light as well as intense pulsed light (IPL) destroy *P. acnes* by absorption of endogenous porphyrins produced by *P. acnes* resulting in a cytotoxic effect on the bacteria.⁵ In contrast, laser therapy using the near infrared spectrum of light are based on thermal damaging the sebaceous glands.⁶

Although there are numerous studies indicating the effective use of 1,064-nm Nd:YAG lasers for the acne scar treatment, there is very little known about efficacy against acne infection.⁷ The 1,064-nm Nd:YAG laser can penetrate the dermis deeply and cause diffuse heating of dermal tissues without damaging the epidermis. The 1,064-nm Nd:YAG lasers have been reported to be effective in the treatment of acne scars and photorejuvenation.² However, the efficacy of long-pulsed 1,064-nm Nd:YAG lasers on inflammatory and noninflammatory lesions of acne vulgaris have barely reported.¹

The possible mechanism of long-pulsed 1,064-nm Nd:YAG laser is derived from its aptitude to penetrate into the skin deeply to thermally and selectively destroy overactive sebaceous glands and reduce inflammatory lesion in acne.⁸ Along with its thermal penetration effects, the 1,064-nm Nd:YAG also promotes the healing process and collagen remodeling, which is associated with the increased expression of transforming growth factor- β in the skin.⁹

Jung et al.² reported a randomized controlled trial with a dual mode of quasi-long pulse and Q-switched 1,064-nm Nd:YAG laser assisted with a topically applied carbon suspension in the patients with acne vulgaris. The carbon particles are distributed to the stratum corneum, and some of them also penetrated into the hair follicles. When activated by the laser light, the carbon undergoes a rapid temperature increase, thereby heating and damaging the follicles and surrounding structures such as sebaceous gland. Based on the study of Jung et al.,² the energy of laser with relatively shorter pulse duration difficultly penetrates the epidermis deeply without carbon suspension. Therefore, laser with longer pulse duration might easily affect sebaceous glands, thereby inflammatory lesion of acne vulgaris could be treated without carbon suspension

In conclusion, the authors suggest that long-pulsed 1,064-nm Nd:YAG lasers can be effectively and safely used for treating inflammatory lesions in the dermis and epidermis, particularly acne vulgaris, in Asian patients. Further prospective, controlled investigations are needed to be followed to compare the efficacy and safety of long-pulsed lasers and to optimize the treatment settings for acne vulgaris.

CONFLICT OF INTEREST

The authors have no conflict of interest to disclose.

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