

# Combination treatment of a 1,064-nm picosecond domain Nd:YAG laser and a pneumatic needle-less injector for en coup de sabre in Republic of Korea: a case report

Sun Hye Shin<sup>1</sup>, Hye Sung Han<sup>2</sup>, Sun Young Choi<sup>2</sup>, Kwang Ho Yoo<sup>2</sup>

<sup>1</sup>Department of Dermatology, Chung-Ang University College of Medicine, Seoul, Republic of Korea

<sup>2</sup>Department of Dermatology, Chung-Ang University Gwangmyeong Hospital, Chung-Ang University College of Medicine, Gwangmyeong, Republic of Korea

En coup de sabre is a form of localized scleroderma involving the frontoparietal scalp and forehead. It often results in cosmetic disfiguring and severe psychological distress. Herein, we report a case of en coup de sabre successfully treated with a combination of a 1,064-nm picosecond domain Nd:YAG laser and a pneumatic needle-less microjet injector. After 10 treatment sessions at 4-week intervals, the lesion showed significant cosmetic improvement. No serious adverse events were observed until the 6-month follow-up. This combination may be a safe and effective option for aesthetic improvement of patients with en coup de sabre. Well-designed clinical studies involving more patients are necessary to further prove its effectiveness and safety.

**Key words:** En coup de sabre; Hyperpigmentation; Picosecond laser; Pneumatic needleless injector

## INTRODUCTION

En coup de sabre is a rare subset of localized scleroderma (also known as morphea) which is characterized by a linear-shaped atrophic patch or plaque on the forehead or frontoparietal scalp. Due to its typical location, it can cause significant cosmetic disfigurement such as hyperpigmentation and fat atrophy, leading to serious psychosocial distress for patients. Various approaches for the treatment of en coup de sabre have been reported in the literature, including systemic immunosuppressants, phototherapy, topical tacrolimus, and topical corticosteroids [1]. Despite such treatments, additional treatment such as injectable fillers, autologous fat transplantation, or laser treatments is often required for aesthetic im-

provement of residual deformity and hyperpigmentation. Herein, we report a case of en coup de sabre successfully treated with a combination of 1,064-nm picosecond domain Nd:YAG laser and pneumatic needleless injector.

A written informed consent was obtained from the patient for the publication of this case report.

## CASE REPORT

A 43-year-old female patient visited our department with an approximately 6-year history asymptomatic linear, depressed patch with hyperpigmentation on her mid-forehead (Fig. 1A). Before visiting our clinic, she was diagnosed with morphea with histopathological confirmation and treated with multiple sessions of ultraviolet A (UVA)

**Received** February 20, 2023, **Accepted** March 2, 2023

### Correspondence

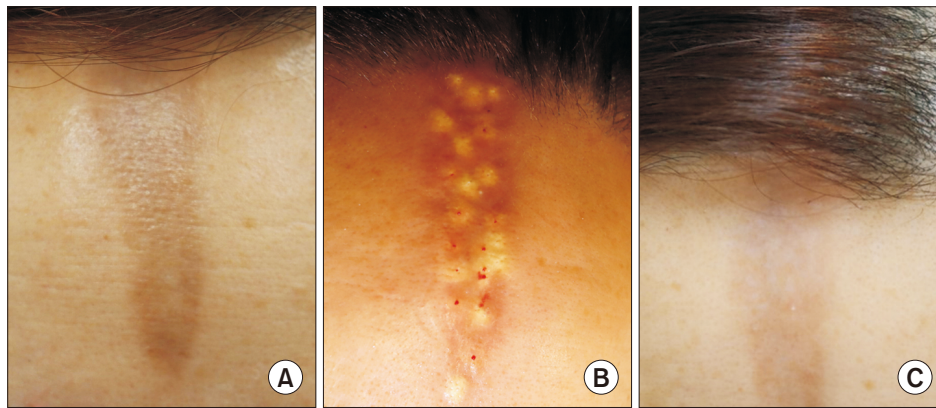
Kwang Ho Yoo

E-mail: psyfan9077@naver.com

ORCID: <https://orcid.org/0000-0002-0137-6849>

© Korean Society for Laser Medicine and Surgery

© This is an open access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (<http://creativecommons.org/licenses/by-nc/4.0>) which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.



**Fig. 1.** Clinical photographs of a 43-year-old female patient with en coup de sabre. (A) Initial presentation at our clinic with a hyperpigmented patch on the mid-forehead. (B) Immediately after performing pneumatic needleless injector treatment. Well-circumscribed, blanching papules are seen at the injection points with mild pinpoint bleeding. (C) Marked improvement of hyperpigmentation and skin texture after ten sessions of 1,064-nm picosecond Nd:YAG laser and pneumatic needleless injector combination therapy.

treatment with topical pimecrolimus cream for 2 years. She also underwent multiple sessions of 1,064-nm Q-switched Nd:YAG laser for hyperpigmentation but the effect was minimal, and she was aesthetically unsatisfied. Since the lesion seems to be stable and inflammatory phase has subsided, no additional treatment with UVA or other systemic agents was done. For the hyperpigmentation, we treated with a 1,064-nm picosecond Nd:YAG laser (PicoPlus<sup>®</sup>; Lutronic) with a spot size of 8-mm, fluence of 0.7 J/cm<sup>2</sup> with a pulse rate of 10 Hz. Then, we delivered an injection fluid composed of 20% hypertrophic glucose solution (JW Pharmaceutical) using a pneumatic needleless air-powered microjet injector device (AIRJET II<sup>®</sup>; Union Medical) at 5 mm intervals without overlapping (50% pressure power, filling level 10, total 20 shots) (Fig. 1B). After 4 treatment sessions at 4-week intervals, improvement in hyperpigmentation and skin texture was observed. Thus, we continued treatment up to the 10th sessions, and the patient exhibited remarkable improvement of the lesion and satisfied with the cosmetic results (Fig. 1C). No serious adverse events including flare-up of en coup de sabre were observed until the 6-month follow-up. The patient reported mild discomfort and erythema after the pneumatic needleless injector session, which subsided within 3 days after the treatment.

## DISCUSSION

Localized scleroderma is an uncommon connective tissue disorder which is characterized by excessive collagen deposition in the skin, resulting in sclerotic changes of the dermis and underlying subcutaneous tissue. Although it is often associated with cosmetic impairment,

there were few clinical data on laser treatment or invasive procedures for cosmetic improvement due to concerns about disease reactivation or aggravation following postprocedural inflammatory reactions [2]. Recently, various energy-based devices including intense pulsed light, pulsed dye laser, Q-switched alexandrite laser, long-pulsed Nd:YAG laser, and CO<sub>2</sub> fractional laser have been reported to show promising results in the correction of telangiectasia, microstomia, skin texture, and joint contracture in a stable localized scleroderma [3].

To our knowledge, this is the first report regarding the use of combination treatment with 1,064-nm picosecond Nd:YAG laser and a pneumatic needleless injector for managing the cosmetic appearance of en coup de sabre. A pneumatic needleless injector device has been shown to induce dermal micro-trauma which stimulates fibroblasts and induce wound healing process, resulting in neocollagenesis and scar remodeling [4]. In addition, Cho et al. [5] and Kim et al. [6] have demonstrated that pneumatic injection of 20% hypertonic glucose solution induces proliferation of fibroblasts, neocollagenesis by stimulating the latent form of transforming growth factor (TGF)- $\beta$  and exerts greater tissue regeneration effect compared to a 5% isotonic solution. Therefore, possible mechanisms of pneumatic needleless injecting 20% hypertonic solution for en coup de sabre might be related to 1) immediate mechanical loosening of sclerotic tissue and releasing skin tightness, similar to subcision and 2) degradation of improperly homogenized collagen bundles via modulation of TGF- $\beta$  signaling during the wound repair process. Additionally, picosecond domain laser exerts photomechanical effects that selectively destroy melanosomes and minimize nonspecific photo-

thermal damage in contrast to Q-switched Nd:YAG laser [7]. Therefore, picosecond laser may provide a safe and effective treatment for hyperpigmentation in en coup de sabre. In this case, we only used an unfractionated beam to selectively target melanin pigments. The concomitant use of a fractionated beam may be also beneficial in the treatment of en coup de sabre by promoting dermal remodeling through the formation of laser-induced optical breakdown [8]. However, further studies are needed to confirm this hypothesis. Although there are no reported cases of disease reactivation of localized scleroderma after picosecond Nd:YAG laser or pneumatic needleless injector treatment so far, clinicians should always be aware of the risk of disease reactivation.

In conclusion, our report suggests that this noninvasive combination treatment may serve as safe and effective treatment option for managing cosmetic appearance of en coup de sabre patients. It is necessary to prove its effectiveness and safety through well-designed controlled clinical studies involving more patients.

## ORCID

Sun Hye Shin, <https://orcid.org/0000-0002-0479-8174>  
Hye Sung Han, <https://orcid.org/0000-0002-3556-0740>  
Sun Young Choi, <https://orcid.org/0000-0003-0248-7708>  
Kwang Ho Yoo, <https://orcid.org/0000-0002-0137-6849>

## AUTHOR CONTRIBUTIONS

Conceptualization: KHY. Data curation: SHS. Methodology: HSH, SYC. Visualization: HSH, SYC. Writing—original draft: SHS, KHY. Writing—review & editing: all authors.

## CONFLICT OF INTEREST

Kwang Ho Yoo is the Editor-in-Chief of the journal but was not involved in the review process of this manuscript. Hye Sung Han is an editorial board member of the journal but was not involved in the review process of this manuscript. Otherwise, there is no conflict of interest to declare.

## FUNDING

None.

## DATA AVAILABILITY

None.

## ACKNOWLEDGMENTS

None.

## SUPPLEMENTARY MATERIALS

None.

## REFERENCES

1. Ulc E, Rudnicka L, Wałkiel-Burnat A, Warszawik-Hendzel O, Niemczyk A, Olszewska M. Therapeutic and reconstructive management options in scleroderma (morphea) en coup de sabre in children and adults. A systematic literature review. *J Clin Med* 2021;10:4517.
2. Creadore A, Watchmaker J, Maymone MBC, Pappas L, Lam C, Vashi NA. Cosmetic treatment in patients with autoimmune connective tissue diseases: best practices for patients with morphea/systemic sclerosis. *J Am Acad Dermatol* 2020;83:315-41.
3. Klimek P, Placek W, Owczarczyk-Saczonek A. Fractional ablative carbon dioxide lasers for the treatment of morphea: a case series and literature review. *Int J Environ Res Public Health* 2022;19:8133.
4. Kim BY, Chun SH, Park JH, Ryu SI, Kim IH. Prospective evaluation of atrophic acne scars on the face with needle-free high-pressure pneumatic injection: quantitative volumetric scar improvement. *Dermatol Surg* 2019;45:829-35.
5. Cho SB, Kwon TR, Yoo KH, Oh CT, Choi EJ, Kim BJ. Transcutaneous pneumatic injection of glucose solution: a morphometric evaluation of in vivo micropig skin and tissue-mimicking phantom. *Skin Res Technol* 2017;23:88-96.
6. Kim H, Yoo KH, Zheng Z, Cho SB. Pressure- and dose-controlled transcutaneous pneumatic injection of hypertonic glucose solution for the treatment of atrophic skin disorders. *J Cosmet Laser Ther* 2017;19:479-84.
7. Ungaksoarnpairote C, Manuskiatti W, Junsuwan N, Wanitphakdeedecha R. A prospective, split-face, randomized study comparing picosecond to Q-switched Nd: YAG laser for treatment of epidermal and dermal pigmented lesions in Asians. *Dermatol Surg* 2020;46:1671-5.
8. Tanghetti EA. The histology of skin treated with a picosecond alexandrite laser and a fractional lens array. *Lasers Surg Med* 2016;48:646-52.

**How to cite this article:** Shin SH, Han HS, Choi SY, Yoo KH. Combination treatment of a 1,064-nm picosecond domain Nd:YAG laser and a pneumatic needle-less injector for en coup de sabre in Republic of Korea: a case report. *Med Lasers* 2023;12:67-69. <https://doi.org/10.25289/ML.23.006>