Case report

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Case report

Combination treatments employing CO_2 fractional lasers with polydeoxyribonucleotide injections for chronic atrophic scar in Republic of Korea: a case report

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The use of ablative lasers for chronic atrophic scars poses a significant challenge, requiring extended downtime and leading to side effects, such as irregular dyspigmentation and post-laser erythema. This case report presents the synergistic treatment a chronic atrophic scar using a CO_2 fractional laser alongside intradermal polydeoxyribonucleotide (PDRN) injections. A 25-year-old female received six sessions of a CO_2 fractional laser treatment at 4-week intervals, coupled with intradermal PDRN injections. The scar exhibited remarkable improvement after treatment, and the patient was satisfied with the outcome. Combining a CO_2 fractional laser with a PDRN injection can enhance wound healing, reduce downtime, and improve the clinical outcomes.

Key words: Fractional CO_2 laser; Polydeoxyribonucleotide; Atrophic scar

INTRODUCTION

Among the current measures to improve chronic atrophic scars, ablative lasers, including the 10,600-nm CO_2 laser and the 2,940-nm Er:YAG laser, have shown efficacy in various clinical studies, resulting in functional and cosmetic improvements [1]. These lasers are known to mechanically destroy scar tissue and promote collagen remodeling through the wound healing process. However, due to epidermal destruction, downtime after the procedure is necessary and may be accompanied by post-procedure side effects such as irregular dyspigmentation and post-laser erythema [1], side effects more commonly observed in individuals with darker skin phototypes, particularly among Asians. To address these concerns, various injectable modalities, including autologous platelet-rich plasma, adipose-derived stem cells, and growth factors, have been explored to minimize downtime and improve post-laser side effects [1,2].

Polydeoxyribonucleotide (PDRN) is a linear nucleotide-based polymer consisting of nucleotides with a chain length ranging from 50 to 2,000 base pairs [3]. PDRN interacts with the adenosine A2A receptor and exerts various biological functions, including anti-inflammatory effects and the acceleration of the wound-healing process [3]. Specifically, PDRN facilitates wound healing by upregulating angiogenesis, promoting cell migration and growth, and enhancing the expression of type I collagen [3]. Due to these beneficial effects, PDRN is actively used to treat several types of wounds [3,4]. In this manuscript,

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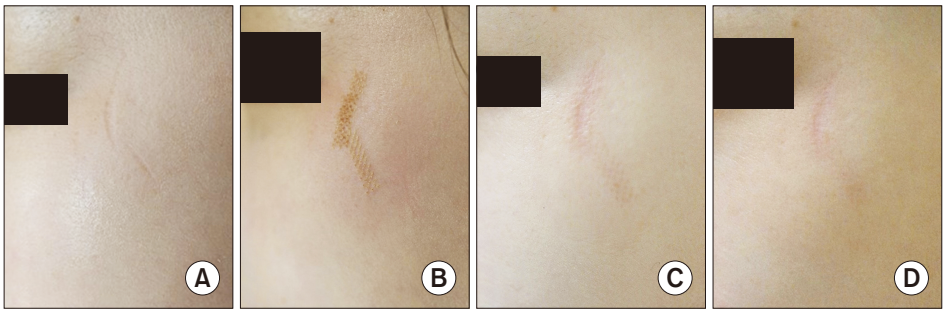

Fig. 1. Clinical photographs of a 25-year-old female patient with a traumatic scar on her left face (A) before treatment; (B) immediately after treatment; (C) two months after two sessions; and (D) six months after six sessions.

we present a case of chronic atrophic scars that were synergistically treated with a CO_2 fractional laser and intradermal PDRN injection.

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

CASE REPORT

A 25-year-old female patient presented with a linear atrophic patch on her left periorbital area (Fig. 1A). The patient recalled a laceration scar from a fall 10 years ago that had never been treated. After obtaining informed consent, we treated her with a CO_2 fractional laser (eCO_2; Lutronic Corporation) using pulse energy of 30 mJ and a spot density of 100 spots/cm^2 (Fig. 1B). Following the laser treatment, we injected 0.5 ml of PDRN (Placentex®; PharmaResearch) into the entire scar area (0.1 ml per point, 5 points, 1 cm interval). After six sessions of laser therapy at 4-week intervals, the atrophic scar showed remarkable improvement, and the patient expressed satisfaction with the result (Fig. 1C, D).

DISCUSSION

A recent in vivo study using a rat model by Yu and Lee [5] found that the PDRN injection group showed faster wound healing after fractional CO_2 laser treatment compared to the control group, with the former exhibiting significantly increased granulation tissue thickness and vascular endothelial growth factor expression. This study demonstrated the potential of PDRN to induce rapid epidermal regeneration and granulation tissue formation after fractional CO_2 laser treatment. These findings support using PDRN as an effective option for reducing downtime and improving clinical outcomes after fractional laser resurfacing by enhancing wound healing and remodeling of the microthermal zones created by the fractional CO_2 laser.

Another study by Ahn et al. [6] reported the effects of PDRN and microlens arrayed type nanosecond-domain Nd:YAG laser combination therapy on postoperative scarring after costal cartilage harvest surgery, further supporting the wound healing-promoting results of PDRN.

Ablative CO_2 fractional lasers have been used and studied for many years to treat various dermatological conditions, including different types of scars. These lasers create microscopic channels of thermal injury and promote collagen remodeling through tissue healing. Furthermore, ablative CO_2 Fractional lasers have also been used to partially remove the stratum corneum and facilitate the delivery of various substances into the dermis. However, due to the spot size created by fractional CO_2 lasers being around 120 μm, it is difficult for PDRN with a large molecular weight to penetrate [7]. Therefore, in our case, we chose to inject PDRN directly into the laser-irradiated area rather than applying it topically.

Although the pain associated with injections can potentially reduce patient satisfaction, the combination of PDRN and CO_2 fractional laser is considered an effective and safe treatment option, as it provides synergistic therapeutic effects while mitigating the expected side effects of CO_2 fractional laser treatment.

Further research is required to determine the specific contributions of CO_2 fractional laser and PDRN to scar improvement, their effectiveness for different scar types, and the optimal treatment intervals. The combination therapy of multiple polymeric materials and energy-based devices is expected to become more diverse and essential in scar treatment.

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AUTHOR CONTRIBUTIONS

Conceptualization: KHY. Data curation: SHS. Formal analysis: HSH. Investigation: KHY. Methodology: SYC. Project administration: KHY. Software: SHS. Validation: KHY. Visualization: SHS. Writing–original draft: SHS. Writing–review & editing: all authors.

CONFLICT OF INTEREST

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

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DATA AVAILABILITY

None.

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SUPPLEMENTARY MATERIALS

None.

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