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755 nm picosecond laser for facial atrophic scar—Case reports of long-term clinical efficacy following up

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Abstract

Introduction: Acne vulgaris is one of the most common dermatological problems in Asia. While the disease itself is self-limited and temporary, the dystrophic texture changes after the inflammatory process are often a serious aesthetic concern. Many energy-based devices have seen good results in treating atrophic acne scars, and the picosecond laser with specific lens is one of the newer options, and lack reports on its long-term efficacy.

Materials and Methods: We report three Taiwanese cases who, to our knowledge, consist of the longest clinical follow-up times for atrophic scar treatment with the 755 nm diffractive lens picosecond laser. Photographs were compared on a by-session basis by two blinded dermatologists independent of the primary treating physician and given an improvement range of <25%, 25%-50%, 50%-75%, and >75%.

Results: While there are minor (<25%) improvements in all cases after the first four treatment sessions, all three cases saw the greatest improvement in skin texture (>75% in two cases, 50%-75% in one) when they were followed up 6, 13.5, and 28 months post-last treatment.

Conclusion: Our results demonstrate excellent, long-onset, and long-term efficacy of the picosecond laser with diffractive lens in the treatment of acne atrophic scars. It also demonstrates the safe use of the device on Asian skins without symptoms of postinflammatory hyperpigmentation.

KEYWORDS

755 nm, atrophic acne scars, long-term effect, picosecond laser

1 | INTRODUCTION

Acne vulgaris is a common disease among Asians, with reported prevalence rates of 36.2% in Korea, 53.5% in China, and 37.5% in India.[1-3] Acne also has a higher tendency to cause postinflammatory hyperpigmentation (PIH) and atrophic scarring in Asian patients when compared with Caucasian patients.[4,5] These sequelae often have a significant impact on the patients' social life and self-esteem and are frequently targets for cosmetic correction. However, treatments with a single modality are often insufficient to deliver satisfactory results, and usually two or more modalities will be required.

Several case series[6-8] have established the clinical efficacy of the picosecond laser in treating atrophic acne scars. Histologically, picosecond lasers cause no ablation of the epidermis and basement membrane, which should greatly lower the risk of damage-induced side effects such as PIH.[6] While the picosecond laser has become

one of the most popular treatment options for facial rejuvenation and atrophic acne scars in Asia, literature on its long-term efficacy is limited by its relatively novel status, and thus shorter follow-up times. A literature search for post-treatment follow-up times from 2015 to 2018 showed the longest follow-up time to be at 8 months ± 2.5 months.[7] In this article, we report three Taiwanese cases, which, to our knowledge, consist of the longest reported clinical follow-up results for atrophic scar treatment with the 755 nm diffractive lens picosecond laser.

2 | CASE REPORT

Case 1 is a 24-year-old man who received 4 sessions of 755 nm picosecond diffractive lens treatment (once per month) and 2 more sessions after a 9-month and 13.5-month treatment-free interval, for a total of 15605 pulses. Significant whole-face scar texture improvement was observed from photographic follow-up at the 5th treatment, with a greater improvement being noted between sessions 3 and 4, compared to sessions 1-3 (Figure 1). Two blinded dermatologists from our clinic (independent from the main treating physician) were asked to assess the degree of improvement between each photograph and gave a rating of <25% after session 3, >50% between sessions 3 and 4, respectively. The patient was satisfied with the treatment result and concurred with the physicians' assessment. Treatment efficacy was also maintained from sessions 5-6.

Case 2 is a 36-year-old woman who received 5 sessions of 755 nm picosecond diffractive lens treatment (a total of 12 493 pulses) for acne-induced pore enlargement and atrophic scarring. While improvement was minimal in between the initial sessions, significant scar texture improvement was observed at the 6 months post-treatment follow-up (Figure 2), and blind assessment by two dermatologists agreed on near-complete improvement between the

FIGURE 1 A 24-y-old, skin type IV man, with significant amounts of rolling and boxcar scars. A, Patient at baseline before treatment. B, 1 mo after 3rd session (time for the 4th session). C, 9 mo after 4th treatment (time for the 5th session). D, 13.5 mo 5th treatment (time for the 6th session)

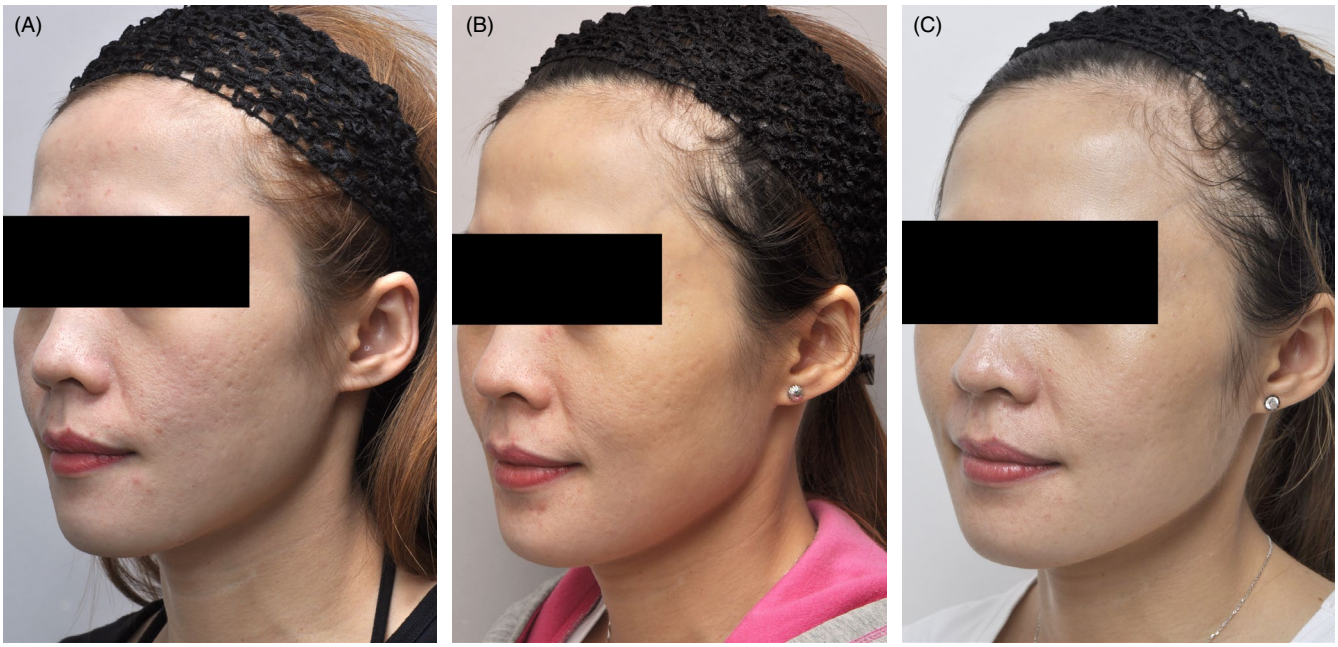

FIGURE 2 A 36-y-old, skin type III woman, with mild-to-moderate scarring on the left cheek. A, Patient at baseline before treatment. B, 2.4 mo after 4th session (time for the 5th session). C, 6 mo after 5th treatment

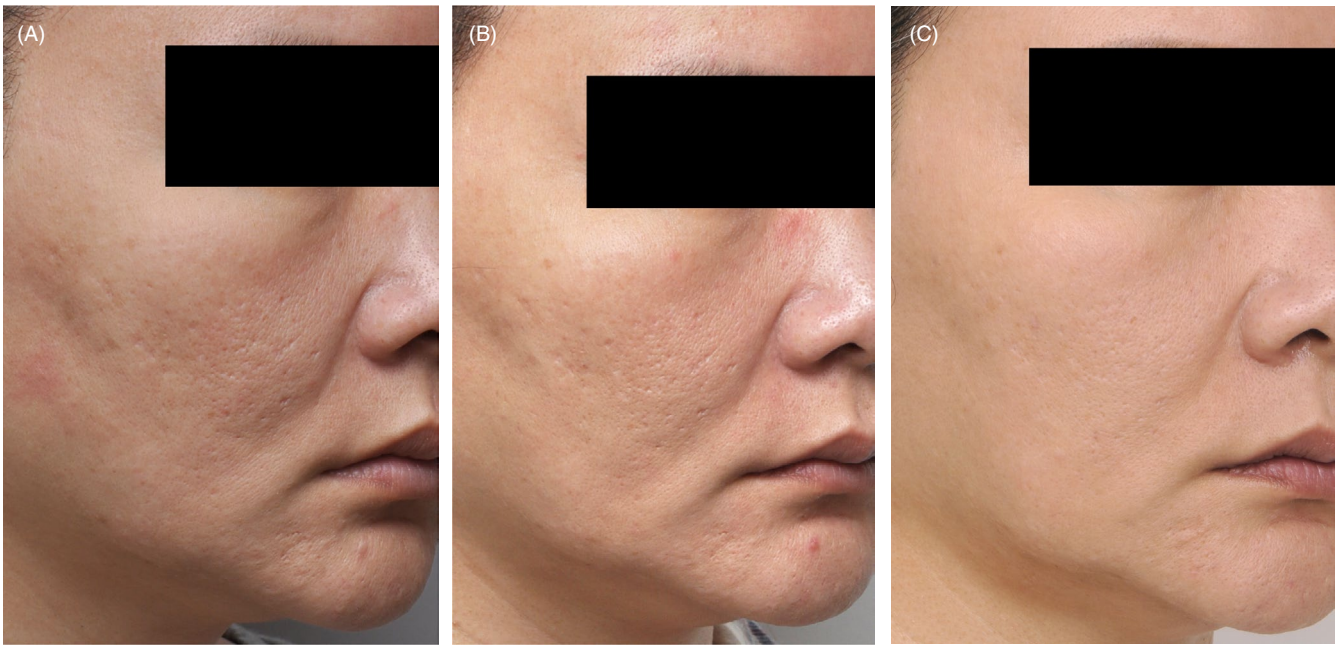

FIGURE 3 A 44-y-old, skin type IV woman, with moderate to severe scarring on the left cheek. A, Patient at baseline before treatment. B, 1 mo after 4th session. C, 28 mo after 4th treatment

last treatment session and the 6-month follow-up. She denied undergoing further laser or surgical intervention past her last session.

Case 3 is a 44-year-old woman who received 4 sessions of 755 nm picosecond diffractive lens treatment (a total of 10 667 pulses) for acne-induced pore enlargement and atrophic scarring. Similar to case 2, significant scar texture improvement was observed at her 28 months post-treatment follow-up (Figure 3). Blind assessment by two dermatologists agreed on near-complete improvement between the last treatment session and the 28-month follow-up. She also denied undergoing further laser or surgical intervention past her last session.

3 | DISCUSSION

While fractional laser resurfacing was established as an effective treatment choice for atrophic acne scars,[8] the viability and efficacy

of the picosecond laser as an alternative have recently been reported in several studies.[9,10] Notably, these results were similar to past results obtained through fractional lasers—a systematic review reported an acne texture improvement of 26%-83% when using an ablative fractional laser, and 26%-50% when using a nonablative fractional laser,[11] compared to 25%-50% when using a 755 nm picosecond laser.[12]

Theoretically, the picosecond laser should induce similar dermal remodeling processes as the fractional laser, which is demonstrated through histological studies on its ability to induce dermal collagen, mucin, and elastin formation.[9] The time required for this remodeling process explains the delayed onset of therapeutic effect—fractional lasers have a reported therapeutic onset time of about 2-6 months post-treatment, and the 755 nm picosecond laser has a reported therapeutic onset time of within 3 months.[9,13,14] Accordingly, all three of our cases demonstrated greater improvement of scar texture several months after the last session, instead of immediately after the conclusion of the treatment regimen. In addition, in a photographic retrospective review[10] also done at our clinic, all patients showed mild-to-moderate scar texture improvement after an average of 4.28 sessions by the 755 nm picosecond laser, with a mean follow-up time of 7.3 weeks. This result is similar in follow-up time and overall efficacy when compared with previous studies utilizing the fractional laser.

Aside from efficacy, the duration or maintenance of therapeutic effect is often another point of concern for patients and physicians alike. The CO_2 fractional laser was shown to retain its therapeutic effect through a follow-up period of 1-3 years.[14,15] As a relatively novel technology, the picosecond laser's long-term efficacy has been under much debate. In our article, the therapeutic effect of the picosecond laser was evident at least 6 months post-treatment and remains significant up to 28 months post-treatment. This may provide tentative grounds to speculate on the semi-permanent nature of dermal remodeling, and cellular markers such as the heat shock protein family (HSP 70 and 48) have been used to track laser-induced remodeling effects.[14]

The lack of significant epidermal tissue destruction after exposure to the 755 nm picosecond laser could suggest that picosecond laser-related dermal collagenesis occurs through regulations to gene expression (photomechanical pathways via factors such as the HSP 70 family or TGF-β), instead of the healing of tissue microlesions (photothermal destruction of cells).[16]

We also report exceptional clinical improvement—over 50% for Case 1 and over 75% for Cases 2 and 3—through blinded assessment by two nontreating dermatologists. A study by Dr Geronemus et al reported a mean clinical improvement grade of 1.4 at 3 months post-treatment (where Grade 0 denotes 0%-25% improvement, Grade 2 denotes 25%-50% improvement, and Grade 3 denotes >75% improvement). Since the collagenesis process usually lasts up to 4 weeks after tissue damage, and overall tissue remodeling may take up to 1 year according to previous wound-healing theories, it is possible that the longer follow-up duration (minimum of 6 months) in this study allowed patients' skins more time to remodel, which resulted in a higher clinical improvement rating.

There is still a lack of global consensus on the ideal picosecond treatment protocol for atrophic scars. A variety of protocols have been reported and shown to be effective, with varying accumulated passes, sessions, and intervals. Previous literature with the same device showed a 24.3% volume increase after 3 months[7] and >75% improvement after an average of 8 ± 2.5 months.[12] Based on our presented cases, we believe a 6 months post-final-treatment follow-up time should be considered, to obtain and record the optimal efficacy of treatment. If patients consent, physicians can wait for the remodeling effects to take place, before recommending further treatment plans.

This case report supports the conception that the 755 nm diffractive lens picosecond laser treatment is an effective and safe treatment option for atrophic acne scar in Asian population, with long-lasting effects that may require multiple months to become evident.

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