

# A Case of Radio Frequency Micro-Needling Combined with Carbon Dioxide Fractional Laser for the Treatment of Severe Post-Acne Scarring

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**Abstract**—Acne scarring is a kind of sequelae of acne, which is the scar left on the patient's skin after acne occurs and the local inflammation is more serious and not controlled in time. It is a disfiguring skin disease that affects patients physically and mentally because it occurs on the face. The treatment of acne scarring has always been a popular and difficult clinical problem. Gold micro-needling is one of the commonly used treatments for acne scarring. Gold micro-needling can bring about some improvement in the extent of scarring, and is also useful for large areas of post-inflammatory erythema, however, it is less effective for icicle-like, compartmentalized, and elevated scarring. The fractional carbon dioxide laser can accurately grind raised, and irregular scarring, which can significantly improve the unevenness of the skin and make the lesions look more even. We report a case of gold micro-needling combined with fractional carbon dioxide laser for the treatment of severe post-acne scarring.

**Keywords**—severe post-acne scarring, radio frequency micro-needling, dioxide fractional laser

## I. INTRODUCTION

Acne is an inflammatory skin disease involving hair follicles and sebaceous glands and is a common and frequent clinical condition [1]. Many severe acne will leave different degrees of scarring after healing, which has a great psychological impact on patients and causes serious distress to their lives and studies. Acne scars are of various forms, and different types of scars can appear on the same patient. For example, large post-inflammatory erythema left after severe acne, depressed atrophic scarring, hyperplastic scarring, and so on. The most common acne scar is the atrophic scar, which can be classified as ice pick-like, carriage-like, and roller-like scar according to morphology [2]. The morphological differences of the scar, the choice of treatment timing and method, and the length of the treatment course determine the repair effect. A case of severe post-acne scar treated with the radiofrequency micro-needling combined with fractional carbon dioxide laser in our department is reported below.

## II. CASE REPORT

### A. Clinical Information

The patient is a 23-year-old male. He presented to the clinic with acne scarring left on his face and neck for more than 3 months. After treatment at an outside hospital, the acne inflammation had resolved, but large diffuse reddish scarring remained on the cheeks, forehead, and both lower jaws, mainly atrophic scarring, with scattered raised plaques on both lower jaws and neck, and complaints of facial tightness and slight pulling sensation on the neck. The patient's appearance was seriously affected and he was eager to seek treatment. He came to the dermatology department in September 2019. Physical examination: good general condition, no abnormal signs in the heart and lungs, and no liver and spleen enlargement. The patient was previously fit, had no history of allergies, and had no special personal or family history. Dermatologic examination: large diffuse light red scarring was seen on the face and neck, mainly atrophic scarring, and scattered raised plaques were seen on both mandibles and neck. The diagnosis was acne scarring. The patient was recommended to undergo radiofrequency micro-needling combined with fractional carbon dioxide laser treatment.

### B. Treatment Method

Before treatment, the patient cleaned the facial skin, applied topical compound lidocaine cream for surface anesthesia, and cleaned and disinfected the anesthetized area after 60 min of cling film coverage. The operator disinfects the RF microneedle handpiece, wears sterile gloves, and installs disposable needles; the patient is instructed to take a supine position and uses the radiofrequency micro-needling treatment instrument, adjusting the microneedle length and power range (depth 0.5–2.0 mm; pulse width 300–1000ms; power 8–16 w) according to the scar condition and depth. The treatment was carried out with the upright handle perpendicular to the skin and evenly arranged in sequence. This was followed by a fractional carbon dioxide laser with a grinding mode for the sharp edges of the scar and a fractional carbon dioxide laser for some carriage-like and icicle-like scars. Such combined treatment was done three

times in total, at 2-month intervals. Patient outcomes and adverse effects were recorded.

### C. Comparison of Effectiveness

After three times treatments, significant therapeutic results have been achieved. For example, in Figs. 1, 2, and 3, the patient's diffuse facial erythema became significantly lighter, the scar became lighter, the facial tightness and the neck-pulling sensation disappeared, the skin tone became lighter, and the facial oil secretion decreased. The patient was satisfied with the overall results.



Figure 1. Comparison of the patient's right face effect.

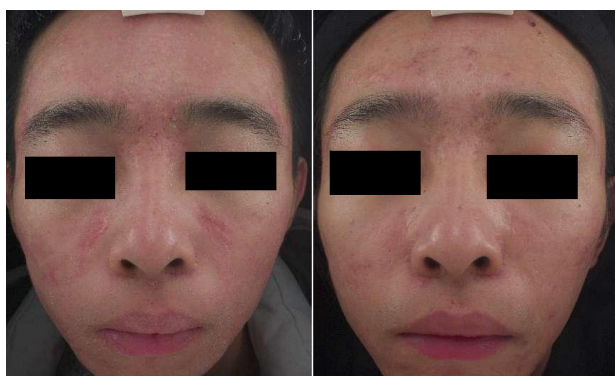


Figure 2. Comparison of the patient's frontage effect.



Figure 3. Comparison of the patient's left face effect.

### III. DISCUSSION

Acne is a chronic inflammatory skin disease that occurs during adolescence and primarily involves the follicular sebaceous gland units of the face. It is mainly

caused by exuberant sebum secretion, keratinization and blockage of follicular sebaceous gland ducts, Propionibacterium acnes infection, etc. If not handled in time, the inflammation of acne is more severe, and erythema or hyperpigmentation, as well as permanent scarring, may remain after healing [3]. Acne scarring has a high clinical incidence and is challenging to treat, causing a heavy burden on the patient's psychology and life, and even a tendency toward depression [4].

Currently, there are many methods for treating acne scarring, including fractional laser, radiofrequency technology, micro-needling, surgical therapy, chemical peeling, fillers, and so on. Fractional laser is the first choice for the treatment of atrophic acne scarring, which promotes the apoptosis of local fibroblasts through the photothermal effect of laser and stimulates the formation of collagen fibers in the deeper layers of the dermis, which further recovers the damaged tissues [5]. At the same time, the carbon dioxide fractional laser has a powerful grinding function, due to its short pulse width, less heat is transmitted to the surrounding during treatment, and the target tissue can be ablated precisely. However, carbon dioxide fractional lasers also have their limitations, with adverse reactions such as acne-like rashes, temporary hyperpigmentation, and persistent erythema occurring in 13% to 17% of patients after treatment [6].

Gold microneedle is a technology that combines microneedle and radiofrequency, mainly through the mechanical stimulation of microneedle, the biological effect produced by radiofrequency instrument and thermal stimulation to promote the skin metabolism and self-repair, and then make collagen regrowth and rearrangement [7]. Its utilization of microneedles into the skin to deliver the energy of radiofrequency, selective destruction of hair follicles sebaceous glands, inhibit the development of follicular inflammation, which contributes to the rapid reparation of the skin; in addition to the gold microneedle radiofrequency treatment process, it can accurately locate the depth of the treatment, layered targeted treatment, the treatment can be maximized to minimize the degree of epidermal damage, compared to the operation of carbon dioxide fractional laser is more safe and simple [8]. At the same time, some studies have observed that the intensity of NF- $\kappa$ B, IL-8, and VEGF expression in skin lesions before and after treatment was reduced by immunohistochemical staining, and it is speculated that gold microneedle may treat post-inflammatory erythema by reducing the inflammatory response and local abnormal vascular proliferation [9].

The patient we treated was too heavily scarred, especially with large areas of post-inflammatory erythema left behind and more icicle-like, carriage-like, and elevated scarring. The radiofrequency micro-needling treatment could improve the degree of scarring to a certain extent, and it was also useful for large post-inflammatory erythema. But it was not ideal for ice pick-like, carriage-like, and elevated scarring, we chose to combine the treatment with CO<sub>2</sub> fractional laser, which could precisely grind the raised, and irregular scarring,

which could significantly improve the uneven skin condition and make the lesions look more This can significantly improve the appearance of uneven skin and make the lesions look flatter. Therefore, the combination of the two treatment options compensates for the inability of the radiofrequency micro-needling to perform superficial grinding and provides a very good synergy to achieve better clinical results.

#### IV. CONCLUSION

The challenge of severe acne scarring left behind after severe acne is indeed a tough one in the clinic. In this case, the use of gold microneedle combined with carbon dioxide fractional laser treatment can enhance the strengths and avoid the weaknesses, effectively improve the patient's efficacy, and is superior to other single treatments. Its efficacy is accurate and safe, and it is worthwhile to apply it in the clinic as an alternative treatment program.

#### CONFLICT OF INTEREST

The authors have declared no conflict of interest.

#### AUTHOR CONTRIBUTIONS

Li Tang is responsible for writing the content, Lan Ge is in search of literature, Yan Xiao is in research of images and contacting the publisher. Yaoying Li is responsible for the full text formatting and layout. All authors had approved the final version.

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