

Research Article

Treatment of Atrophic Acne Scars of the Face with Plasma Radiofrequency Ablation

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Introduction

Acne vulgaris is a very common chronic inflammatory disease of the pilosebaceous units, usually starting in adolescence and often leading to serious complications such as fibrosis and scarring. Acne scarring can be categorized into different types depending on whether there is a loss or damage of collagen and other tissue (atrophic scars), or a gain of collagen fibers formation (hypertrophic scars and keloids) [1]. Atrophic scars appear when dermal collagen and connective tissue production inadequately compensate for tissue loss, they are depressed below the surrounding skin and are most common on the face. Hypertrophic scars are raised scars that remain within the boundaries of the original lesions. Keloid scars, on the other hand, spread beyond the margins of the original lesions, invading the surrounding normal skin, and are localized more frequently on the back and chest [2].

Atrophic acne scars of the face are a permanent disfiguring sequela leading to serious negative effects on psychologi-

Abstract

Introduction: Acne vulgaris is a very common chronic inflammatory disease of the pilosebaceous units, usually starting in adolescence and often leading to serious complications such as fibrosis and scarring. Atrophic acne scars of the face are a permanent disfiguring sequela with negative effects on psychological well-being and a significant impact on quality of life. Their treatment is complex and conventional approaches such as dermabrasion, chemical peels, dermal filler injections, or autologous fat transfer, have poor effects. Laser treatments may be used as alternative therapies, however, post treatment collateral effects such as persistent erythema, hyperpigmentation, prolonged healing times, infections, and even worsening of scarring, limit their application, especially for Fitzpatrick skin type III and IV. The demand for best results associated with minimally invasive and safe technology, and less downtime for the treatment of atrophic scars has stimulated the search for novel therapeutic strategies. **Objectives:** The aim of this study is to evaluate the effectiveness of plasma radiofrequency ablation (PRF) in the treatment of atrophic acne scars of the face performed with DAS Medical device (Technolux).

Methods: Ten patients affected by aesthetically unpleasant atrophic acne scars were enrolled for PRF ablation treatments.

Results: A significant aesthetical improvement was observed after three PRF ablation sessions of treatment for all patients, which showed a reduction of the visibility and depth of the scars.

Conclusions: Plasma radiofrequency ablation technique can be considered a good option to meet the need for less invasive and safe technology for the treatment of atrophic acne scars.

cal well-being and have a significant impact on quality of life. Their treatment is complex due to the different morphologies of scars; ice pick, box car, and rolling scars are the most common types [3].

Conventional approaches proposed for the treatment of atrophic acne scars include dermabrasion, chemical peels, dermal filler injections, or autologous fat transfer, however, they have poor effects [4,5]. Additionally, laser treatments may be used as alternative therapies. Ablative lasers such as carbon dioxide laser or Erbium Yag laser, or ablative fractional lasers such as CO2 fractional laser have been shown to have some beneficial effects; however, post treatment collateral effects such as persistent erythema, hyperpigmentation, prolonged healing times, infections, and even worsening of scarring, limit their application, especially for Fitzpatrick skin type III and IV [6-7]. Further, ablative fractional laser treatments are also associated with discomfort and downtime, which can be limiting



Figure 1: 1A: Atrophic post-acne scars on the face 1B: Clinical results after 3 PRF ablation treatments: Reduction in visibility and overall improvement of the scars.



Figure 2: 2A: Atrophic post-acne scars on the left temple 2B: Clinical results after 3 PRF ablation treatments: Smoothing and improvement of texture of the skin with a reduction in the visibility of the scars.

for patients with work and school commitments. Non-ablative laser treatments instead have been shown to be safer but with sporadic effects on atrophic scar improvement.

Objectives

Over the past 30 years, the treatment of acne scars has undergone changes influenced by the concurrent development of new devices. The demand for best results associated with minimally invasive and safe technology, and less downtime for the treatment of atrophic scars, has stimulated the research for novel therapeutic strategies. The aim of this study is to evaluate the effectiveness of Plasma Radiofrequency (PRF) ablation in the treatment of atrophic acne scars of the face performed with DAS Medical device (Technolux).

Methods

Ten patients (seven females and three males, 28–37 years; skin phototypes I–IV) affected by aesthetically unpleasant atrophic acne scars were enrolled for PRF treatments (Figures 1A, 2A). Patients with keloids and hypertrophic acne scars were excluded from the study. All patients signed an informed consent form to gain access to the treatments. The exclusion criteria for the study included a history of keloid formation, active oral and facial herpesvirus infection, and a history of collagen vascular disorders. No other contraindications to treatment, such as Fitzpatrick skin types V–VI, presence of tanning, concomitant infection, diabetes, pregnancy, use of oral isotretinoin within the previous 6 months, presence of autoimmune diseases, ablative skin procedures carried out within the previous 3 months, and malignancy, were present. The area to be treated was anesthetized with topical anesthetic cream (ASENSIL, Lidocaine 4%, Logofarma s.p.a.) without occlusion for 30 minutes. Before starting the treatments, the anesthetic cream was removed with sterile gauze, and the area to be treated was disinfected with antiseptic solution.

Atrophic acne scars were treated with PRF ablation at 0.6 watt energy and 3Hz frequency, with detached spots of sublimation performed on the edges around the scars, leaving columns of intact epidermis and sparing the central atrophic part, both to break down the edges and to stimulate the filling of the central skin depression through a controlled heat transfer. Each treatment session took approximately 20 minutes to complete.

All patients underwent three sessions of treatment, carried out at 40 days interval. After each treatment, they applied an antibiotic ointment for 10 days, avoiding sun exposure between the sessions and for the following 6 months.

Results

The treatment as well as the post-treatment period were well tolerated by all patients. Postoperative discomfort was rated as 2 on a scale of 1 (no discomfort) to 10 (extreme discomfort). At the end of the sessions, a moderate burnishing and erythema were observed; re-epithelialization with normalization of skin appearance occurred within 7 days. No side effects such as infections, hypo/hyperpigmentation, or scarring occurred in any patient. A significant aesthetical improvement was already observed after two PRF ablation sessions of treatment for all patients, which showed a reduction of the visibility and depth of the scars. All patients were followed up at 3 and 6 months from the last treatment. The outcome was visible at 1 months from last treatment for all patients (Figures 1B, 2B). A Visual Analog Scale (VAS) score was used to evaluate the patient satisfaction rate in a range from 0 to 10. All patients showed a high satisfaction rate with a VAS > 8.

Discussion

Plasma Radiofrequency (PRF) ablation consists of the generation of plasma energy that thermally heats tissue in a uniform and controlled manner, inducing a sublimation of the tissue [8]. Plasma is “the fourth state of the matter” derived by ionization of neutral gases present in the air, it is a unique state of matter in which electrons are stripped from atoms to form an ionized gas. The plasma is emitted in a millisecond pulse to deliver energy to target tissue without any reliance on skin chromophores. The technology can be used at varying energy settings for different depths of effect, from superficial epidermal effects such as microdermabrasion, to deeper dermal heating such as

carbon dioxide resurfacing laser [9-14]. The DAS Medical device utilizes plasma energy created from the ionization of atmospheric gas between the device and the skin, working without any contact between the toe and the skin. The resulting plasma spark sublimates the superficial layers, immediately transferring the stored thermal energy to the skin surface, heating in a controlled uniform manner without an explosive effect on tissue [10,11]. The PRF energy triggers micro plasma sparks in the air between the tip of the device and the skin surface, producing mild epidermal ablation and perforating the dermis superficially with the spot of 1mm diameter. The mild epidermal sublimation leaves a layer of intact and desiccated epidermis, while also stimulating, avoiding damaging, on the deeper layers of the skin. Thus, in addition to a mechanical effect that shapes the surface it impacts, the detached spots of the sublimation technique induce a thermal effect that promotes skin regeneration and extensive dermal fibroblast remodeling, including new collagen synthesis and deposition. PRF ablation technique can be considered a good option to meet the need for less invasive and safe technology for the treatment of atrophic acne scars. The advantages of this technique include lack of absolute contraindications, minimal intraoperative pain, quick treatment, rapid formation of postoperative protection layer, fast healing of wound surface, immediate return to normal activity, a good cost-effectiveness ratio, with optimal results in treatment of atrophic acne scars. Another advantage to PRF ablation with respect to laser devices, is the lack of affinity for chromophores. In fact, infrared wavelengths, such as those in erbium glass and erbium or carbon dioxide lasers, however limited, have an affinity for melanin, and so the PRF action has also the advantage to create fewer instances of hyperpigmentation.

In conclusion, PRF ablation technique can be considered a good option to meet the need for less invasive and safe technology for the treatment of atrophic acne scars. It is a relatively new technique and few studies evaluating its effects on acne scars have been published. In the future, further clinical studies on a larger number of patients are needed to better determine the effects of the PRF ablation on this field of application.

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