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Treatment of Atrophic Acne Scars on Latin American Skin Types with CO_2 Fractional Laser and Radiofrequency. Report of Three Cases

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Treatment of Atrophic Acne Scars on Latin American Skin Types with CO_2 Fractional Laser and Radiofrequency. Report of Three Cases

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Background: Atrophic scars are among the most frequent and difficult to treat consequences of acne, and have a significant impact on the patient's quality of life. The different types of Laser therapies available for treating atrophic scars have shown efficacy, but great care must be taken on Latin American skin types in order to prevent serious complications, such as post-inflammatory hyperpigmentation. However, the CO_2 fractional laser associated with simultaneous radiofrequency (RF) is an excellent choice for treating this common pathology in the Latin American population. The CO_2 fractional laser with simultaneous radiofrequency delivers a precise and appropriate amount of energy to target tissue, helping to achieve very good results, and decreasing side effects in such patients compared with other traditional therapies. The main objective of this study was to evaluate the improvement to atrophic acne scars caused by CO_2 fractional laser and radiofrequency on Latin American skin types.

Materials and Methods: We conducted an observational retrospective study. We reviewed the clinical records of patients with atrophic acne scars treated with CO_2 fractional laser and simultaneous RF from January 1, 2014 through December 31, 2015. During this period, we had found 3 patients with Fitzpatrick skin phototype IV, 2 men and one woman, who met the inclusion criteria. Treatment of these patients initiated with skin preparation, followed by the CO_2 fractional laser and radiofrequency SmartXide² by DEKA. We performed a total of 3 sessions, each 2 months apart, with a fluency of 2.23 J/cm² - 3.49 J/cm² resulting from the combination of parameters, and RF of 10-15 Watts. After performing the procedure, we applied anti-inflammatory creams, skin protectors, sunscreen, and we resumed application of hydroquinone-free hypopigmentation creams on the treated areas at day 15 after treatment. Patient evaluation was performed monthly during treatment and subsequently at 3 months, recording all information provided by each patient in their medical files, in addition to an objective evaluation with photographic comparison.

Results: After the last evaluation, there was a global improvement that patients defined as significant. In terms of the photographic objective control, improvements to skin texture, homogenization of skin tone and decrease in depth of the atrophic scars were observed, with the evaluator estimating the improvement at 60-70%.

Conclusion: The treatment of atrophic acne scars with CO_2 fraction laser and simultaneous RF is a safe and effective therapeutic mode for Latin American skin types, leading to significant improvements in such lesions, while reducing the number of treatment sessions and therefore decreasing the possible complications associated with laser treatments.

Keywords: CO_2 fractional laser, ablative, pulsed radiofrequency, scar, and acne.

Introduction

Acne is one of the most frequent diseases of the skin, affecting approximately 50 million people in the United States of America. In Latin America, epidemiologic data is scarce, but the few studies available have shown an estimated prevalence as high as 96% of the adolescent population, in a study performed in Sao Paulo, Brazil[1,2]. One of the most frequent consequences of severe acne are atrophic scars, which are difficult to treat and have a significant impact on patient quality of life[3,4]. For this reason, it is crucial to find the appropriate treatment for each patient in order to improve the lesions and consequently the quality of life. Acne patients who develop scars often show a prolonged inflammatory response that causes significant destruction of dermal collagen, subsequently generating an atrophic scar. This exaggerated response may be due to patient predisposition or to the severity of the underlying disease[2].

There are multiple therapies available for the treatment of acne scars, including chemical peels, surgical resection, fillers in affected areas, and laser treatments. Laser treatment has recently become one of the most widespread and valuable tools in the management of these patients, due to its significant results[3,5]. Before the introduction of fractional photothermolysis, ablative lasers, which generated a superficial vaporization of the outer layer of the epidermis and part of the papilary dermis, were used for many indications, including atrophic acne scars, leading to a healing process that generated the new collagen responsible for the clinical improvement of the atrophic scars. Given that this technique produces significant thermal damage in the target tissue, that in turn causes a noteworthy inflammatory process, the side effects are considerable and can persist for prolonged periods[3]. For this reason, fractional ablative lasers have become the treatment of choice for atrophic acne scar patients. As opposed to traditional ablative lasers that completely vaporize the epidermis and dermis, the innovative fractional ablative laser technology generates areas of thermal microdermabrasion. These columns of thermal damage penetrate the epidermis and reach the papillary dermis, and are each surrounded by an area of intact tissue, which will favor tissue recovery and lead to less severe and prolonged side effects. The technology implemented in these lasers enables the operator to vary the size of the space between columns, the diameter of the incident beam and the depth of the damage, giving the doctor greater control over thermal damage to the skin, and providing a more personalized treatment according to skin type, type of lesions, and other characteristics inherent to each patient[3,4,6,7].

The CO_2 fractional laser also modifies the biochemical environment of the treated area by stimulating the secretion of growth factors and cytokines that favor the healing process. Prignano et al found that after CO_2 fractional laser treatment, there was an increase in and stimulation of various molecules such as platelet-derived growth factor (PDGF), endothelial growth factor (EGF), transforming growth factor beta (TGF-B) and basic fibroblast growth factor, on the target tissue. In addition, the new CO_2 fractional lasers permit the use of simultaneous radiofrequency as an adjuvant therapy[8]. Radiofrequency improves elasticity and skin tone by generating deeper thermal stimulus in the reticular dermis without an ablative effect on the skin, thus stimulating the synthesis of new collagen and elastin[9]. Currently, it is safe to use CO_2 fractional lasers associated with radiofrequency on Latin American skin types thanks to technological advances which provide a combination of different parameters that deliver a precise amount of energy to target tissue, improving the therapeutic effect and decreasing side effects. In addition, treatment with CO_2 fractional laser and radiofrequency reduces the number of sessions needed to treat atrophic acne scars, and decreases post-treatment down times.

Materials and Methods

An observational retrospective study of Latin American patients with skin phototypes III-IV treated with CO_2 fractional laser and radiofrequency for atrophic acne scars over two years, from January 1,

2014 through December 31, 2015, at a laser private practice in Bogotá, Colombia. We found a total of 3 patients, including 2 men and 1 woman. We reviewed the medical records and photographs available for each case.

Case Reports

Case 1

A 27-year-old woman, with no medical history of importance, presented to the medical appointment aiming to improve her acne scars. On physical examination, the patient was a Fitzpatrick skin phototype IV, with generalized facial dyschromia secondary to multiple post-inflammatory hyperpigmentation macules. In addition, there were multiple rolling and icepick atrophic scars located on the cheeks and forehead. No inflammatory and non-inflammatory acne lesions were noted (figure 1).

Figure 1. Case 1 patient before any laser treatment.

Case 2

A 38-year-old man without any medical records presented to the medical office for a history of atrophic scars on his face. Physical exam showed the patient was a Fitzpatrick skin phototype III, with numerous rolling, boxcar and icepick atrophic scars predominantly located on the cheeks and frontotemporal region of the face, as well as on the submental skin. No inflammatory and non-inflammatory acne lesions were noted (figure 2).

Figure 2. Case 2 patient before any laser treatment.

Case 3

An otherwise healthy 26-year-old man sought medical help for multiple atrophic acne and traumatic scars on his face. On physical examination, the patient was a Fitzpatrick skin phototype IV, with facial dyschromia, linear atrophic scars on the right periorbital area, and several boxcar and rolling atrophic scars on the cheeks. No inflammatory and non-inflammatory acne lesions were noted (figure 3).

Figure 3. Case 3 patient before any laser treatment.

All patients had signed an informed consent, and had performed a skin preparation protocol starting 20 days before the procedure. The skin preparation protocol included the application of a hydroquinone-free depigmenting cream every 12 hours (suspended 8 days before the laser session), a sunscreen with an SPF greater than 30, and prophylaxis for herpes simplex reactivation with acyclovir 800 mg every 8 hours for 7 days (starting 48 hours before the laser session), where there was a history of herpes simplex infection. Prior to each session of CO_2 fractional laser and simultaneous radiofrequency, a topical anesthetic was applied to the target area 1 hour before the procedure. During the treatment session, ice packs were used on the target area in order to minimize discomfort.

Three laser sessions were performed, every 2 months, with the laser Smartxide² by DEKA, with the following parameters:

CO_2 fractional laser

- Dwell time: 500 – 600 µs
- Spacing: 600 – 800 µm
- SmartStack: 2
- Emission Mode: Smartpulse (SP) – D-pulse (DP)
- Density: 7.3% – 10.7%
- Fluence: 2.23 J/cm² – 3.49 J/cm²
- Pulse energy: 24.5 mJ – 46.2mJ

Bipolar simultaneous radiofrequency

- Power: 10 – 15 W
- Emission Time: 3 s
- RF Dwell time: 20 s

After each laser session, all patients received gentamicin 0.1% + betamethasone 0.05% ointment for 7 days, and then a skin protector with zinc, aloe vera, manzanilla extract and calendula for another 7 days. Subsequent to the skin preparation period, sunscreen was applied 3 times a day. Treatment with hydroquinone-free hypopigmentation cream was restarted 15 days after the procedure.

Results

Each patient was assessed monthly during the treatment period, and then 3 months after the last laser session. All the information provided by each patient in the medical record was collected, and an objective evaluation of the photographic material, and the pictures before and after treatment were compared. Overall, an improvement of the treated area was found, defined by the patients as significant. In terms of the photographic objective control, improvements to skin texture, homogenization of skin tone and a decrease in the depth of the atrophic scars were noted, estimated by the evaluator as an improvement of 60-70%. See figures 4, 5 and 6. As for the adverse effects, no moderate or severe side effects were reported, the

Figure 4. Case 1 before (**A**) and after three sessions (**B**) of CO_2 fractional laser and simultaneous radiofrequency for atrophic acne scars on the cheeks and forehead.

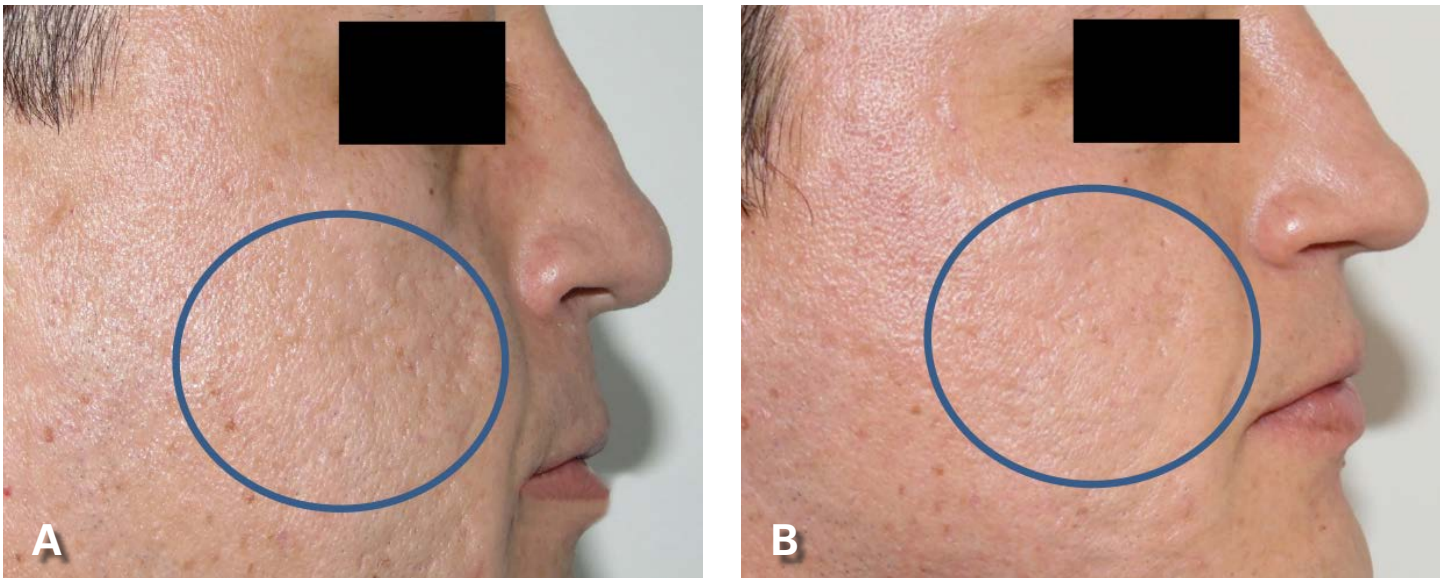

Figure 5. . Case 2 before (**A**) and after three sessions (**B**) of CO_2 fractional laser and simultaneous radiofrequency for atrophic acne scars on the cheeks and frontotemporal region.

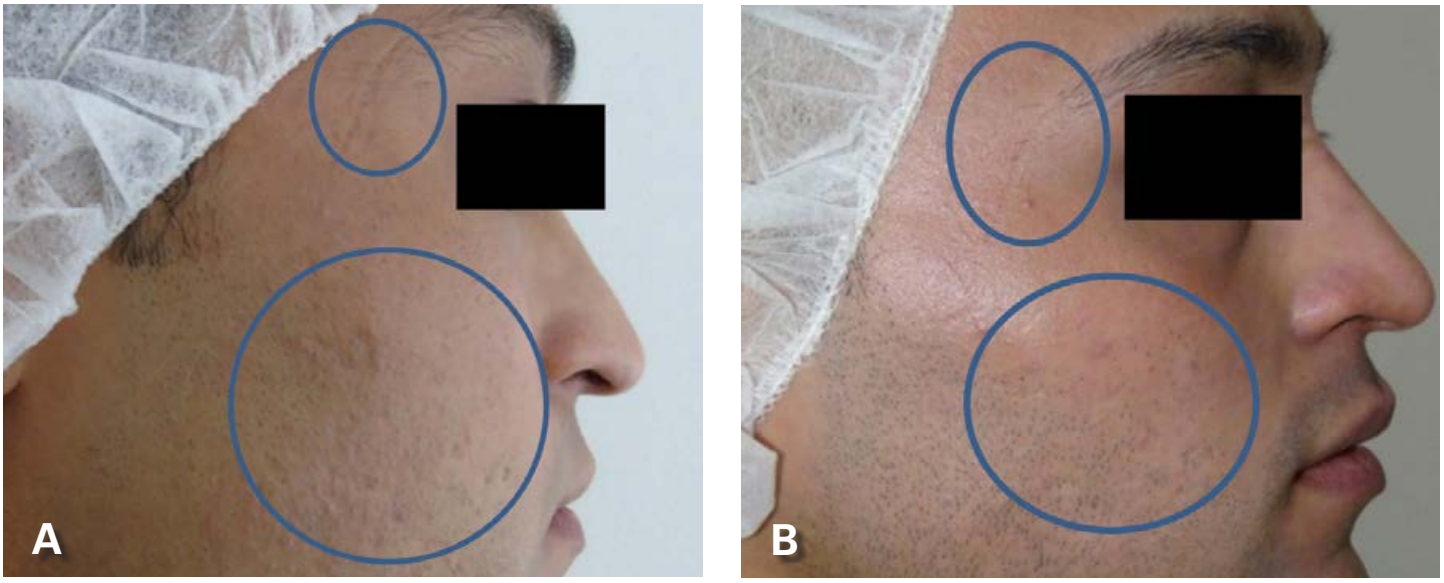

Figure 6. . Case 3 before (**A**) and after three sessions (**B**) of CO_2 fractional laser and simultaneous radiofrequency for atrophic linear traumatic scar on the right periorbital region and atrophic acne scars on the cheeks.

patients presented immediate mild pain, erythema, and desquamation that gradually improved over time. None of the patients presented post-inflammatory hyper- or hypopigmentation.

Discussion

Fractional ablative lasers have become the treatment of choice for patients with atrophic acne scars. These lasers generate areas of thermal microdermabrasion as opposed to the complete vaporization of the epidermis and dermis by continuous ablative lasers. The columns of thermal damage penetrate the epidermis and reach the superficial areas of the papillary dermis, but each column is surrounded by an area of intact tissue that favors quicker recovery and diminishes the possibility of prolonged and severe side effects[3,4,6,7]. Pigmentary disorders in the Latin American population are not so different from those in other latitudes. Loss or excessive pigmentation is a very frequent cause of medical consultation, but there are many different conditions that vary depending on the geographical location of the patient, which is why

it is of great importance to study and treat each patient individually and according to the social, geographical and ethnic background[10]. Additionally, treatment for hyperpigmentation disorders in darker skin phototypes can lead to severe complications such as post-inflammatory hyperpigmentation that can worsen the original condition of the patients. Therefore, although they are a great tool for the treatment of many dermatologic conditions, laser treatments need to be managed with caution, especially in darker skin phototypes such as those most frequently seen in the Latin American population. Adequate preparation of the skin with hypopigmenting creams is necessary in the days before the procedure to reduce the risk of post-inflammatory hyperpigmentation.

The use of fluencies of between 2-2.7 J/cm^2 has shown significant histological changes, and has favored the expression of various growth factors[3]. Higher fluencies (4.15 J/cm^2) have shown longer recovery times, and are related to a higher incidence of side effects[8]. Newer technologies that have parameters such as stack, which is the sequence of pulses in the same microthermal zones, improves distribution of the energy applied, decreasing the side effects and providing more objective control of depth[7,11]. The CO_2 fractional laser simultaneously used with radiofrequency has a synergic response, which provides advantages in the treatment of such patients, such as the lack of effect on melanin plus the beneficial aspects of the controlled denaturation of collagen, and epidermal tightening. It is also safer, creates greater tissue contraction and has a regional biostimulatory effect[9,12].

We present 3 cases of Latin American patients, Fitzpatrick skin phototype III-IV, with atrophic acne scars, treated with the combination of CO_2 fractional laser and radiofrequency with excellent results and no significant side effects.

Conclusions

The association of simultaneous CO_2 fractional laser and radiofrequency is a safe and effective therapeutic mode for treating atrophic acne scars in the Latin American population with darker skin phototypes. The synergic activity of this association enhances the beneficial effects without increasing adverse events, decreasing the number of sessions needed to treat the lesions, and even reducing recovery times and the risk of moderate or severe side effects. The side effects from this combination are mild, and they respond adequately to the management recommended after treatment. We recommend adequate preparation of the skin before the laser sessions, in a standardized way to prevent postinflammatory hyperpigmentation, a frequent adverse effect in darker skin phototypes.

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