

Case Reports

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Microneedling: a case series associated with drug delivery

Microagulhamento: série de casos associados drug delivery

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ABSTRACT

Six patients underwent two sessions of microneedling associated to drug delivery on the face, hands or stretch marks, at three-week interval between sessions. Patients were evaluated using clinical analysis and objective measures. Compared to baseline, objective face analysis showed decrease in acne lesions and improvement in the skin texture. The evaluation of stretch marks showed great improvement, and face and hands presented excellent results compared to baseline. The association of microneedling to drug delivery for rejuvenation of the face and hands, and for the treatment of stretch marks presented promising results in our study.

Keywords: administration, cutaneous; hyaluronic acid; rejuvenation; striae distensae; tranexamic acid; hydroxyproline

RESUMO

A associação do microagulhamento com o drug delivery tem-se mostrado benéfica pois potencializa os resultados de ambas as técnicas. Seis pacientes foram submetidas a duas sessões dessa associação de técnicas no tratamento da face, mãos e estrias, com intervalo de 20 dias.

As avaliações foram realizadas por fotografias comparativas padronizadas. Os resultados revelaram redução da acne e melhora das manchas e textura da pele na face, melhora das manchas e textura da pele das mãos, e redução das dimensões e visibilidade das estrias. O presente estudo apresentou resultados promissores associando microagulhamento e drug delivery para tratamentos dermatológicos em face, mãos e estrias.

Palavras-chave: administração cutânea; ácido hialurônico; rejuvenescimento; estrias de distensão; ácido tranexâmico; hidroxiprolina

INTRODUCTION

Microneedling has a range of clinical indications, and is performed with a polyethylene cylinder provided with sterile stainless steel microneedles. Among the objectives that can be achieved with this technique are cutaneous rejuvenation, the treatment of scars and spots, and the penetration of active principles in the skin. Several studies have been conducted to demonstrate that microneedling effects drug delivery, promoting increased skin permeability by creating microchannels, which stimulate the transepidermal/transdermal conveyance of drugs.¹ In the case series presented in this paper, the authors describe the use of microneedling associated to drug delivery in the treatment of stretch marks and skin rejuvenation of the face and hands.

MATERIALS AND METHODS

The treatment protocols of six female patients, aged between 30 and 50 years, are described below. Two patients underwent microneedling for the treatment of stretch marks, two for treating melanosia and rejuvenate the hands' skin, and two for treating melanosia and rejuvenate the facial skin. The device used was the Dr. Roller® (Moohan Enterprise, South Korea), with needle with lengths of 2 mm (for facial procedures), 1.5 mm (hands) and 2.5 mm (stretch marks). The topical anesthetic Dermomax® (Aché Laboratory, São Paulo, Brazil) was applied 30 minutes before the procedure and removed using 0.2% aqueous chlorhexidine. Two sessions were performed in each region observing a 20-day interval. The procedure was performed by rolling the device on the patient's skin surface in "back and forth" movements up until a uniform pattern of petechiae emerged – after 10 to 15 passes in the same direction plus four transversal passes on the same area, inflicting 250–300 punctures /cm².^{2,3} Once the procedure was performed, cleansing was carried out with 0.9% saline followed by the application of the formulation prepared for *drug delivery*.

On the face and hands a serum containing the association of 0.4% tranexamic acid, 1.5% 4-hexylresorcinol, 1% alpha bisabolol, 2% Belides and 2% peptide TGP-2 was applied. Another serum containing 4% hydroxyprolisilane, 5% active omega, 2% regestril, 2% matrixyl 3000, and 1.5% IGF serum was applied in the stretch marks. For 30 days the patients used at home the same formulations, which were dispensed by Farmatec Farmácia de Manipulação Ltda. (Porto Alegre, RS, Brazil).

The assessments were performed based on the clinical analysis of photographs taken before and 30 days after the second session for all patients. Patients who underwent facial microneedling were also objectively evaluated using the FOCCO Facial® device (Fabinject Technology, Taubaté, SP, Brazil), outfitted with three types of lighting, used to carry out the photographic records: daylight (RGB), ultraviolet light (emulates the use of a Wood's lamp), and polarized light. By analyzing baseline and follow up photographs, the device evaluates the parameters *spots* (visible to the naked eye and under ultraviolet light), *wrinkles*, *texture*, *pores*, *skin hydration level*, *reddish areas* and *porphyrin* (acne lesions), comparing the findings between experimental timepoints.

RESULTS

According to the data obtained with assistance of the FOCCO Facial® device, both patients who underwent facial procedures experienced reduction of *acne* (52% and 69%) and improvement in *skin texture* (16.2% and 10.7%). One of the patients also had improvement in the number of *pores* (28.5%), decrease in the number of *spots* (20.3%) and improvement in the *skin's sensitivity* (25%). The clinical evaluation, based on photographs taken before and 30 days after the last procedure and carried out on the stretch marks evidenced satisfactory improvement in all the parameters evaluated (*texture*, *thickness of stretch marks* and *visibility* in the photos – Figure 1). A similar outcome was clinically observed in the evaluation of *spots*, *texture* and *skin*

quality in patients who underwent the procedure in the hands (Figure 2). In the evaluation performed on the face, the parameters *redness*, *acne* and *pores* were rated with reasonable results, while the other variables (*texture*, *spots*, *skin quality*, *wrinkles* and *rhytids* – Figure 3) yielded a high degree of improvement.

DISCUSSION

The association of microneedling with drug delivery has proven beneficial because it enhances the outcomes of both techniques. According to a study by Kalil *et al.*, the association of a cosmetic formula with microneedling enhances the result of skin rejuvenation by 28%.⁴ Microneedling results in the loss of cutaneous integrity, which triggers the healing process and culminates with the formation of type I collagen, which influences skin rejuvenation and scar improvement.² For the remodeling of collagen, the needles need to reach a depth of 1 to 3mm, so that the dermis is reached; However, only 50% to 70% of the needles penetrate during the rolling process, meaning that the needles used for collagen remodeling must be at least 1.5mm long. Microneedling increases the skin's permeability for approximately 48 hours; this lapse can be expanded with the assistance of occlusion, which delays the stratum corneum's restoration, also taking into consideration that the combination of used substances is anhydrous and water repellent.¹ Other factors that affect the skin's permeability are the properties of drugs (ionization, concentration, liposomes or nanoparticles), the presence of cosolvents, pH, viscosity and the presence of permeators.^{2,5-8} In addition to the vehicle's hydrophobicity characteristics, the formula used in the present study had low viscosity – which increases the drug delivery capacity – and contained hyaluronic acid in its composition – which delays the closure of the pores – and active principles with modified permeation systems aimed at achieving greater penetration.^{5,6} According to a study by Milewski *et al.*, liposomal, nanoencapsulated, vectorized and lipophilic active principles reach higher tissue concentration than hydrophilic macromolecules.⁵ In addition to the fact that the physicochemical characteristics of the active substances aided permeation – consequently boosting outcomes – the specific mechanism of action of each particular active principle may have contributed positively for the observed results.



FIGURE 1: Stretch marks before and 30 days after the last microneedling session: decrease in the thickness and number of striae

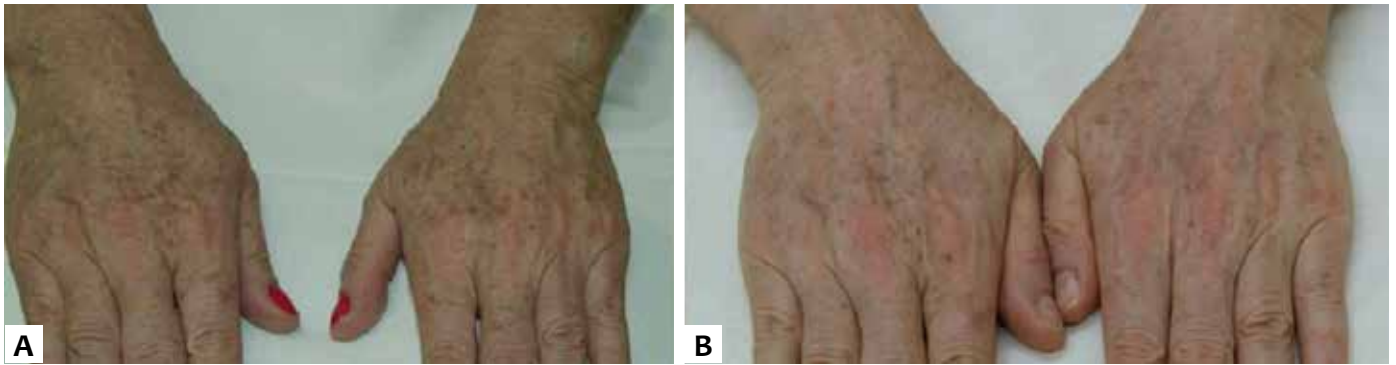


FIGURE 2: Hands before (2a) and 30 days after (2b) the last microneedling session performed with a roller with 1.5mm long needles. In addition to the whitening of the region, it is possible to observe improvement of the texture and quality of the skin



FIGURE 3: Photographs of the face at baseline (3a and 3c) and 30 days after the second session (3b and 3d) using a roller with 2.0mm long needles: improvement in spots, texture, skin quality, wrinkles and rhytids

In the formula for the photorejuvenation of the hands and face, active principles were used to inhibit tyrosinase (tranexamic acid and 4-hexyl resorcinol), endothelin-1 / modulator of melanocytes' response to ultraviolet radiation (belides),

α -MSH hormone / melanin production activator (alpha bisabolol for both its anti-inflammatory and inhibitory activity) and TGP-2 peptide as an inhibitor of melanosome formation.⁹ The set of active principles, each of which with different mechanisms of action on the synthesis of melanin, may have been responsible for the whitening observed on the hands and face (Figures 2 and 3). In addition, it was possible to observe excellent results in the microneedling and drug delivery technique applied to stretch marks largely due to a set of active principles that act on the synthesis of collagen and elastin – such as hydroxyprolislane and matrixyl 3000 – or that inhibit collagenase – such as regestril and active omega. All these active principles act synergistically to increase the skin's hydration and reduce the stretch marks' thickness by acting on several mechanisms of action.⁹

CONCLUSION

The present study showed promising results with the technique that associates microneedling to specific formulas for drug delivery for treating the face, hands and stretch marks. The drug delivery technique deserves emphasis due to the fact it optimizes the outcomes of microneedling, calling attention to the benefit of the association of procedures, leading to more promising results provided by the stratum corneum's increased permeability. Due to the fact it is an innovative technique with a short recovery time – not precluding the patient from carrying out daily activities – and that can be applied in high skin phototypes with minimal risk of adverse effects as compared to other techniques that are, for instance, contraindicated in melasma, the studied method deserves further investigation aimed at confirming the findings of the present report. Published studies exploring the use of microneedling for drug delivery are fewer than those linked to the use of ablative lasers – either fractional or not – therefore calling for new studies aimed at clarifying the doubts that persist about the subject. ●

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