

Treatment of hypochromic scars with ablative fractional laser and bimatoprost drug delivery: a pilot study

Tratamento de cicatrizes hipocrômicas com laser fracionado ablativo e drug delivery de bimatoprost: estudo-piloto

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ABSTRACT

Introduction: The treatment of hypochromic scars is challenging, and the techniques used so far show unsatisfactory results. Bimatoprost, an analog of prostaglandin F₂-alpha, has been used as a topical pigment agent, and its application as drug delivery can optimize its delivery to the dermis and potentiate pigmentation.

Objective: To evaluate the safety and efficacy of Ablative Fractional Laser (AFL) treatment associated with bimatoprost 0.03% drug delivery in hypopigmented scars.

Methods: The patients were submitted to the AFL, followed by the application of bimatoprost 0.03% in 4 sessions with biweekly intervals. Clinical evaluations and standardized photographs were performed. Patients' satisfaction was assessed using a 5-question questionnaire.

Results: All patients had clinical improvement in the treated areas. The degree of patient satisfaction agreed with the clinical evaluation and photographic records.

Conclusion: The application of AFL associated with bimatoprost 0.03% drug delivery can be a potentially effective and safe treatment for hypochromic scars.

Keywords: Lasers; Hypopigmentation; Laser Therapy

RESUMO

Introdução: O tratamento das cicatrizes hipocrômicas é desafiador, e as técnicas até então utilizadas demonstram resultados pouco satisfatórios. A bimatoprost, um análogo da prostaglandina F₂-alfa, tem sido utilizada como agente pigmentante tópico e sua aplicação sob forma de drug delivery pode otimizar a sua entrega na derme e potencializar a pigmentação.

Objetivo: Avaliar a segurança e a eficácia do tratamento com laser fracionado ablativo (LFA) associado ao drug delivery de bimatoprost 0,03% em cicatrizes hipopigmentadas.

Métodos: Os pacientes foram submetidos ao LFA, seguindo-se a aplicação de solução de bimatoprost a 0,03%, em quatro sessões com intervalo quinzenal. Foram realizadas avaliações clínicas e de fotografias padronizadas. A satisfação dos pacientes foi avaliada por meio de um questionário com cinco perguntas.

Resultados: Todos os pacientes obtiveram melhora clínica das áreas tratadas. O grau de satisfação dos pacientes coincidiu com a avaliação clínica e com os registros fotográficos.

Conclusão: A aplicação do LFA associado ao drug delivery de bimatoprost 0,03% pode ser um tratamento potencialmente eficaz e seguro para as cicatrizes hipocrômicas.

Palavras-Chave: Lasers; Cicatriz; Hipopigmentação

Original Article

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INTRODUCTION

Hypochromic scars are common complications in patients undergoing deep exfoliative surgical procedures and after traumatic wounds or burns.^{1,2} Treatment of hypochromia is challenging, and none of the methods described in the literature has proven completely effective thus far.

Bimatoprost has been used in a growing number of studies with the objective of promoting pigmentation of hypochromic lesions of various etiologies. Thus, like latanoprost and travoprost, bimatoprost is an analog of prostaglandin F₂-alpha (PGF₂-alpha). PGF₂-alpha analogs are used in the treatment of glaucoma, and their dermatological importance lies in one of their principal side effects: skin hyperpigmentation.^{3,4,5,6,7,8,9,10}

The mechanism by which hyperpigmentation occurs has not been completely elucidated, but it is inferred to occur through a process similar to that caused by ultraviolet radiation and inflammation. Both induce the production of prostaglandins, which act by stimulating dermal melanocytes.¹¹ Anbar et al. further suggest that activation of prostaglandin receptors can promote dendritic proliferation in melanocytes and increase tyrosinase expression, factors that purportedly contribute to increasing skin pigmentation.^{3,12,13,14} Prostaglandin analogs have been used especially to treat vitiligo, and various case series and clinical trials have been published with promising results.^{3,4,5,13,15,16}

The use of bimatoprost in the treatment of hypochromia is limited basically to its topical application on the intact skin or in the form of drug delivery associated with different types of technologies.^{17,18}

Ablative fractional laser (AFL) increases the penetrative capacity of drugs applied in the form of drug delivery.^{19,20} Clinical trials have shown that the channels produced by AFL provide successful delivery of small particles in the dermis, whether hydrophilic or lipophilic.²¹ The technology breaks the skin barrier and creates vertical channels in the treated tissue, surrounded by zones of healthy tissue. Such channels facilitate the penetration and absorption of active ingredients in skin, besides allowing rapid reepithelization due to the adjacent zones of healthy skin.

This pilot studies assesses the safety and efficacy of treatment of hypopigmented scars using AFL associated with drug delivery of bimatoprost 0,03% in four patients.

METHODS

Four patients (from 16 to 53 years of age, Fitzpatrick skin types II-V) with hypochromic scars were submitted to treatment with AFL (2940nm, Plataforma Ethera® -Vyndence Medical Brazil, São Carlos, SP, Brazil), followed by application of bimatoprost 0,03% in the form of drug delivery.

Patients underwent the treatment after signing an informed consent form. The research project was approved by the Institutional Review Board of Souza Marques Technical Educational Foundation (CAAE: 90753218.8.0000.5239).

Case 1 (Figure 1) presents a hypochromic scar on the neck following a burn with an electric wire. Case 2 (Figure 2) displays hypochromic scars on the face after a CO₂ laser re-

surfacing procedure. Case 3 (Figure 3) shows a hypochromic scar on the neckline following surgical removal of an epidermal cyst. Case 4 (Figure 4) shows a hypochromic scar on the malar region after a burn from Nd:YAG (1064nm) long pulse laser for treatment of facial telangiectasias. All the respective scars had a history of more than a year of evolution.

Patients were submitted to treatment with AFL followed by application of 0,03% bimatoprost solution with local massage. The parameters were: energy: 12,5mj; pulse: 300 microseconds; tip 100mtz/cm². The substance was maintained on the treatment site for a minimum of six hours, and was removed with local washing with water. Four sessions were performed, at two-week intervals.

Photographs were taken in the same setting before the treatment and 30 days after the last session. Patient satisfaction with the treatment was assessed with a five-item questionnaire (Chart 1).

RESULTS

Follow-up examination at four weeks after the last session showed that all the patients obtained clinical improvement in the treated areas. Patient satisfaction coincided with our clinical evaluation and with the photographic records. Two patients



FIGURE 1: Male patient, 16 years, with hypochromic scar on the neck, before (left) and after (right) treatment with AFL and drug delivery bimatoprost 0.03%



FIGURE 2: Female patient, 35 years, with hypochromic scars on the face, before (left) and after (right) treatment with AFL and drug delivery bimatoprost 0.03%

were satisfied with the results and two others were very satisfied. All four answered “yes” to the other questions, except for one female patient who responded that the treatment had not reached her expectations of improvement, although she was satisfied. Figures 1, 2, 3, and 4 show the results.

DISCUSSION

Besides AFL, the treatment modalities used thus far include cosmetic tattooing, medium-depth chemical peels, dermabrasion, skin graft, cosmetic camouflage, and various forms

of phototherapy and other laser therapies.² AFL has been the technology of choice for promoting drug delivery in the majority of the recently published studies. The break in the stratum corneum with the formation of microchannels surrounded by a coagulation zone allows the active ingredients' effective and relatively controlled penetration. Waibel et al. assume that the area of denatured tissue surrounding the microchannels can function as a barrier that maintains the active ingredients in the dermis, thus reducing their systemic absorption and consequently making the procedure safer.²²

The low density and low fluency used in this case are consistent with the settings described in the literature.^{22,23,24} Such settings are based on a study by Bachhav et al., showing that there is a minimum density of channels needed to reach maximum penetration of the active ingredients, and there is no improvement in delivery when these values are increased. Meanwhile, low fluencies ensure a favorable thermal damage zone and produce microchannels with adequate depth to maintain the active ingredients in the dermis.^{22,23,25} The efficacy of the use of bimatoprost in the treatment of hypochromic lesions was assessed by Massaki et al. and Regis et al. in recently published studies.^{17,18} In both, the authors used bimatoprost in the form of drug delivery in association with topical application at the patient's home. In the current case series, bimatoprost was only used in the form of drug delivery, which allowed evaluating this method's efficacy alone, which had not been described previously in the literature. All four patients obtained improvement in the treated areas and expressed satisfaction with the procedure. Still, we hypothesize that maintaining the treatment sessions and home application of bimatoprost on the treated areas can help obtain superior results to those observed here.

CHART 1: ASSESSMENT OF PATIENT SATISFACTION WITH THE TREATMENT	
1. Do you think your scar improved?	
<input type="checkbox"/> Yes	<input type="checkbox"/> No
2. Do you think the treatment reached your expectations of improvement?	
<input type="checkbox"/> Yes	<input type="checkbox"/> No
3. If necessary, would you repeat this treatment?	
<input type="checkbox"/> Yes	<input type="checkbox"/> No
4. Do you think the symptoms during application of the treatment were worth it?	
<input type="checkbox"/> Yes	<input type="checkbox"/> No
5. How would you rate your satisfaction with the treatment?	
<input type="checkbox"/> Very satisfied	<input type="checkbox"/> Satisfied
<input type="checkbox"/> Dissatisfied	<input type="checkbox"/> Very dissatisfied



FIGURE 3: Female patient, 41 years, with hypochromic scar on the neckline, before (left) and after (right) treatment with AFL and drug delivery bimatoprost 0.03%



FIGURE 4: Female patient, 53 years, with scar on right malar region, before (left) and after (right) treatment with AFL and drug delivery bimatoprost 0.03%. Patient also underwent a session of long pulse Nd:YAG laser for the telangiectasia on the site

CONCLUSION

This pilot study shows that the application of AFL associated with drug delivery of bimatoprost 0,03% can be a potentially safe and effect treatment of hypochromic scars.

Long-term follow-up is recommended to measure the sustainability of this response. Controlled studies with larger patient samples are necessary to assess the role of AFL and bimatoprost in the pigmentation of hypochromic scars. Still the current results demonstrate that this can be a promising treatment. ●


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