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# Drug delivery of topical anesthetics as an effective technique for reducing pain in microneedling: a pilot study

Drug delivery de anestésicos tópicos é uma técnica eficaz para diminuição da dor no microagulhamento: um estudo-piloto

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**ABSTRACT**

**Introduction:** Microneedling, also known as percutaneous collagen induction therapy, is a safe and effective procedure, mostly used for rejuvenation, treatment of scars, melasma, alopecia, and other conditions, as well as for drug delivery. Despite the safety and benefits of this technique, the control of pain during the procedure is its major limiting factor.

**Objectives:** To assess whether the drug delivery system for topical anesthesia immediately before a microneedling session is capable of reducing the pain.

**Methods:** A split-face pilot study was carried out with nine consecutive cases of microneedling that had been indicated for the treatment of acne scars, rejuvenation and collagen induction. All patients underwent cleansing of the skin followed by the application of topical anesthetics on the entire face, and drug delivery with a 0.5mm roller only on the left hand side of the face. Next, all anesthetics were removed and microneedling with a 1.0mm roller was performed on both sides of the face.

**Results:** There was a significant reduction of the pain on the left hand side of the face, where the drug delivery was carried out ( $p < 0.01$ ), with a mean value of 3.33 ( $\pm 1.49$ ) on the Visual Analogue Scale as compared to the right hand side, which yielded a mean value of 5.22 ( $\pm 1.74$ ).

**Conclusion:** The topical anesthetic drug delivery technique was effective and successful in reducing the pain during microneedling procedures carried out in the study's patients group.

**Keywords:** anesthetics, local; collagen; scars

**RESUMO**

**Introdução:** O microagulhamento, também conhecido como terapia percutânea de indução de colágeno, é procedimento seguro e eficaz, usado para rejuvenescimento, melhora de cicatrizes, melasma, alopecias e outras indicações clínicas, bem como drug delivery em geral. Apesar dos benefícios e da segurança da técnica, o controle da dor ainda é seu maior fator limitante.

**Objetivo:** Avaliar se a realização de drug delivery de anestésicos tópicos imediatamente antes do microagulhamento pode diminuir a sensação de dor.

**Métodos:** Estudo-piloto de casos, split face com nove pacientes consecutivos, buscando tratamento para cicatrizes de acne, rejuvenescimento e melhora da firmeza da pele. Após limpeza da pele, foi aplicado creme anestésico tópico em toda a face, seguido de drug delivery deste com roller de 0,5mm somente no lado esquerdo. Imediatamente após, o anestésico foi removido de toda a face e realizado o microagulhamento nos dois lados com roller de 1mm.

**Resultados:** O lado esquerdo da face, onde foi realizado drug delivery do anestésico tópico antes do microagulhamento, apresentou significativa diminuição da dor ( $p < 0,01$ ) com média de 3,33 ( $\pm 1,49$ ) quando comparado com o lado direito da face [média de 5,22 ( $\pm 1,74$ )], no qual foi aplicado o mesmo anestésico e pelo mesmo tempo.

**Conclusão:** Neste ensaio, a técnica de drug delivery do anestésico tópico foi eficaz e segura para diminuir a sensação de dor durante o microagulhamento.

**Palavras-chave:** anestésicos locais; colágeno; cicatrizes

## INTRODUCTION

Microneedling, also known as percutaneous collagen induction therapy, is a minimally invasive procedure originally described by Fernandes,<sup>1</sup> in 2002 for the treatment of acne scars and fine wrinkles. Currently it is also considered effective for stretch marks, scars in general, melasma and other pigmentary disorders, “open pores”, hyperhidrosis, allocation and rejuvenation.<sup>2</sup> There is a formation of micro-channels in the skin and release of multiple growth factors that induce an increase in the thickness of the epidermis and collagen production.<sup>3</sup> It is a safe procedure and has proven efficacy for many indications, but pain control still is a limiting factor for the wider use of the technique.

Topical anesthetics are widely used before microneedling, reducing the pain in a noninvasive way. The most common consist in creams with a eutectic mix of lidocaine 2.5% and Perla came 2.5%, lidocaine 4% or lidocaine and tetracaine in high concentrations, the latter available in Brazil only if compounded.<sup>5</sup> Despite its practical and noninvasive use, the efficacy of topical anesthetics is limited by the presence of the epidermal barrier.

In this study we report a series of nine consecutive cases submitted to microneedling on the skin under previous topical anesthesia associated to drug delivery only on the left side. The objective was to evaluate if the performance of drug delivery could reduce the sensation of pain during the procedure.

## METHODS

A pilot, split face study was conducted with the participation of nine female patients, whose age ranged from 25 to 53 years. The indications for the procedure for treatment of acne's cause, facial rejuvenation and improved firmness of the skin. Inclusion criteria were patients for the indication for the technique, good health and availability for the date scheduled. Exclusion criteria were tanned skin, the presence of malignancies or infectious lesions on the face.

Initially, degermation with water and neutral soap and adequate disinfection of the face with alcohol 70%. Immediately after, 1 g of topical anesthetic with lidocaine 23% and tetracaine 7% (Farmácia Artesanal de Jundiaí, São Paulo, Brazil) was applied on 7 patients and lidocaine 4% cream (Dermomax® Laboratório Aché, São Paulo, Brazil) on 2 patients. The choice of the type of anesthetic used in the length of application was random. After an interval that ranged from 11 to 40 minutes (table 1), drug delivery of the topical anesthetic previously applied was performed on the left side of the face of all patients with a roller with 192 0.07 mm thick and 0.5 mm length microneedles (Dr. Roller®, Moohan Enterprise CO., LTD. – South Korea), arranged in eight rows. Subsequently, the anesthetic cream was removed from the whole face with saline 0.9% and then a new microneedling with an identical roller but with 1 mm length needles (Dr. Roller®) was performed (Figure 1).

After the procedure, the patients performed a self-evaluation of the pain experienced on the left side and on the right side of the face according to a visual analog scale (figure 2)<sup>6</sup> without interference of the researcher. The patients could also

write about relevant observations regarding the procedure in their evaluation.

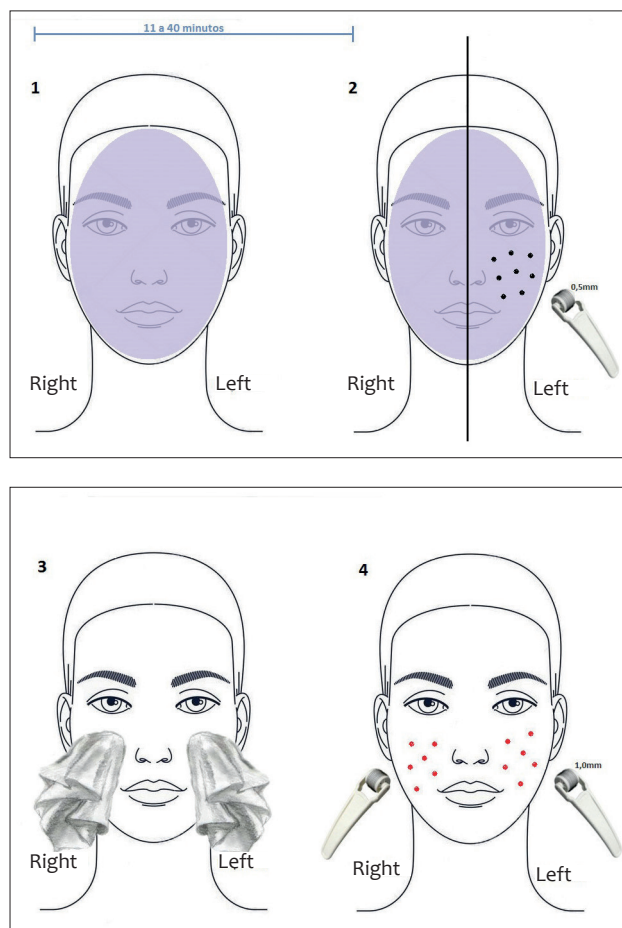
## RESULTS

Data obtained are shown in table 1.

Mean pain assessment was 3.33 ( $\pm$  1.49) on the left side and 5.22 ( $\pm$  1.74) on the right side.

mean for the pain assessment of the patients who had the anesthetic for longer than 20 minutes (patients A, B, C, D, E and F) was of 3 ( $\pm$  1.73) on the left side and 5.33 ( $\pm$  1.88) on the right side. The mean for pain assessment of the patients who had the topical anesthetic for less than 20 minutes (patients G, I and H) was of 4 ( $\pm$  0) on the left side and 5 ( $\pm$  1.41) on the right side. Confidence interval was highly significant with the paired t test ( $p$  = 0.005).

There was a statistically significant correlation ( $p$  = 0.0045) between the time the anesthetic remained on the skin



**FIGURE 1:** Steps of the procedure. **1:** Application of local anesthetic all over the face. **2:** Drug delivery of the topical anesthetic with a roller with 0.5 mm length microneedles (Dr. Roller®) only on the left side of the face. **3:** Removal of the anesthetic cream from the whole face with saline. **4:** Microneedling of the whole face with 1 mm length microneedles (Dr. Roller®)

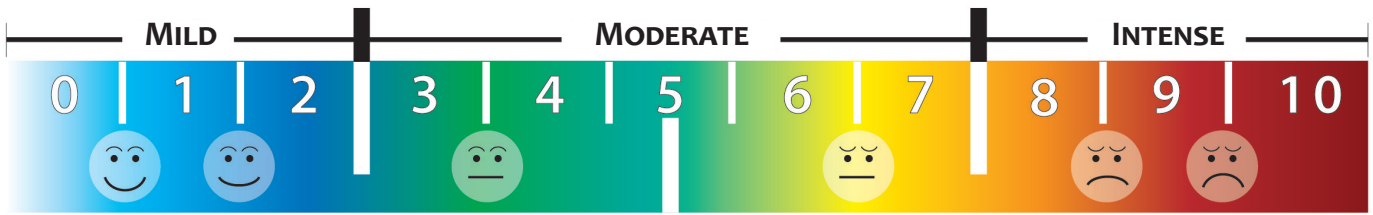


FIGURE 2: Visual analog scale for the assessment of pain intensity<sup>6</sup>

TABLE 1: Results obtained				
Pacient	Type of anesthetic	Time <sup>†</sup> (in minutes)	Pain left side <sup>Ⓛ</sup>	Pain right side <sup>Ⓜ</sup>
A	Lido 23%/Tetra 7%*	40	3	7
B	Lido 23%/Tetra 7%	39	1	2
C	Lido 23%/Tetra 7%	39	1	4
D	Lido 23%/Tetra 7%	38	4	7
E	Lido 4%‡	31	3	5
F	Lido 23%/Tetra 7%	23	6	7
G	Lido 23%/Tetra 7%	19	4	7
I	Lido 4%	15	4	4
H	Lido 23%/Tetra 7%	11	4	4
<b>Mean(±SD)</b>		<b>28.33 (± 10.84)</b>	<b>3.33 (± 1.49)</b>	<b>5.22 (± 1.74)</b>

\* Lidocaine 23%/Tetracaine 7% cream (Farmácia Artesanal – Jundiaí (SP))

‡ Lidocaine 4% cream (Dermomax™)

† Represents the time in minutes of the anesthetic in contact with the skin before starting the procedure.

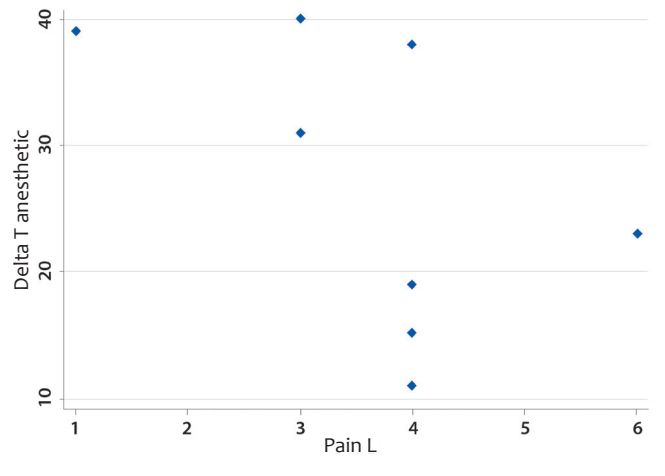
Ⓛ Represents the score according to the Visual Analog Scale for pain on the left side of the face and Ⓜ for the right side.

and the degree of pain on the left side (graph 1). The longer the anesthetic remained on the skin, the lower the pain after drug delivery of the anesthetic.

Some observations were reported by the patients after the procedure. Patients D and F reported that in the beginning the pain on the left side was smaller, but by the end of the procedure the sensation of pain was equal on both sides. Patients E and G reported that the difference in the intensity of the pain occurred mainly on the forehead. Patient B reported that the pain was only on the nose, on the right, and on the forehead bilaterally.

In this study, all the patients that used the topical anesthetic lidocaine 23%/tetracaine 7% cream developed erythema after the application, which became more pronounced after the drug delivery. By the end of the experiment, it was homogeneous. No patient had any other side effects during or after the procedure.

Patients were contacted one month after the procedure and an improvement of the scars and firmness of the skin, as well as a reduction of fine wrinkles was seen. All patients stated they would undergo this treatment again.



GRAPH 1: Correlation between the time of permanence of the anesthetic (in minutes) and pain on the left side (according to the scale used)

## DISCUSSION

Microneedling is a safe procedure with fast recovery, with a proven efficacy for many indications.<sup>2</sup> Many ways of minimizing pain have been used, such as simple topical anesthetic or local injectable anesthetic.<sup>7</sup> The transdermal application (drug delivery) of substances through microneedling is an effective technique in multiple indications.<sup>8</sup>

The use of 0.5 mm depth microneedles enables the separation of epidermal cells, preserving the integrity of the skin. With this, there is an increased permeability to the substances applied topically.<sup>8,9</sup> In the case of topical anesthetics, the drug delivery allows a higher penetration, enhancing its action and reducing the sensation of pain.<sup>7</sup>

This pilot study evaluates the viability of the methods, with a reduced sample and lack of randomization of the sides. Therefore, the variation of the type of anesthetic used in the time it remained on the skin (it ranged from 11 to 40 minutes). The results of this study show a statistically significant difference in the sensation of pain of microneedling after drug delivery of the topical anesthetic ( $p < 0.01$ ). Besides, data point for a time of permanence of the anesthetic longer than 20 minutes needed to obtain a more effective response.

In 2016,<sup>7</sup> El-Fakahany and Medhat used microneedling to boost the effect of topical and aesthetics, however, contrary to this study, microneedling was performed first in the applica-

tion of topical anesthetic came after. Despite this difference, both studies showed efficacy in the technique for reduction of pain.

Side effects of the use of topical anesthetic are known, such as local erythema and edema, pruritus, paresthesia, drowsiness, agitation, seizures and even respiratory arrest in case of fire doses. Although no side effects were reported in this study, drug delivery of topical anesthetics, particularly those with a high concentration, should be performed responsibly and cautiously due to the possibility of intoxication by local anesthetics. It is important to respect the maximum allowed those and educate patients in identifying early signs of intoxication by local anesthetics, alerting the team and washing the face immediately.

## CONCLUSION

We conclude that in the present study the drug delivery technique of topical anesthetic was effective and safe. The only side effect seen was erythema the beginning of the procedure, with no compromise of the efficacy or results. Better controlled studies and with a large number of patients are needed in this case. ●

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### DECLARATION OF PARTICIPATION:

#### Flávio Barbosa Luz:

Design and execution of the study, text review, guidance and supervision

#### Stella Meirelles Siqueira:

Literature review, data tabulation and writing of the text

#### Luiza Alonso Pereira:

Organization of the study

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