

# CO<sub>2</sub> laser enhanced with modified CROLL technique optimizing results in the perioral region rejuvenation

*Laser de CO<sub>2</sub> potencializado com técnica de CROLL modificada otimizando resultados no rejuvenescimento da região perioral*

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## ABSTRACT

**Introduction:** The rejuvenation of the perioral region is considered a significant challenge. Numerous therapeutic modalities are used; however, there is no specific single gold standard, and the literature agrees that the best option is to associate techniques. Fractional lasers provide excellent results, and the CO<sub>2</sub> laser is described as quite effective.

**Objective:** To increase the efficiency of fractional CO<sub>2</sub> laser for the perioral region rejuvenation, using the modified CROLL technique.

**Methods:** We selected 12 female patients, between 50 and 68 years, who underwent application of the CO<sub>2</sub> laser in two moments. Initially, the modified CROLL technique was applied to the perioral rhytids, and later the laser was used, with less power, on the entire face, including the perioral area. Three sessions were conducted with an interval of 45–60 days.

**Results:** There was an improvement in tissue elasticity and rhytids superficialization, and the degree of satisfaction of all patients was in line with the clinical evaluation and photographic records.

**Conclusions:** The CO<sub>2</sub> laser offers excellent results for the perioral region rejuvenation, especially when enhanced with the modified Croll technique.

**Keywords:** Laser Therapy; Lip; Rejuvenation; Research and New Techniques

## RESUMO

**Introdução:** O rejuvenescimento da região perioral é considerado um grande desafio. Inúmeras modalidades terapêuticas são utilizadas, porém não há um procedimento específico ideal, sendo consenso da literatura a associação de técnicas, considerada a melhor opção. Os lasers fracionados proporcionam excelentes resultados sendo o de CO<sub>2</sub> descrito como bastante eficaz.

**Objetivo:** Aumentar a eficácia do laser fracionado de CO<sub>2</sub> para o tratamento de rejuvenescimento da região perioral, utilizando a técnica de CROLL modificada.

**Métodos:** Selecionaram-se 12 pacientes do sexo feminino, com idades entre 50 e 68 anos, com aplicação do laser de CO<sub>2</sub> em dois momentos. Inicialmente, foi aplicada a técnica de CROLL modificada sobre as ríntides periorais e, posteriormente, o laser foi aplicado, com menor potência, em toda a face, incluindo a área perioral. Foram realizadas três sessões com intervalo de 45-60 dias.

**Resultados:** Houve melhora na elasticidade tecidual e superficialização das ríntides, e o grau de satisfação de todas as pacientes esteve em consonância com a avaliação clínica e os registros fotográficos.

**Conclusões:** O laser de CO<sub>2</sub> oferece excelentes resultados para o tratamento do rejuvenescimento da região perioral, sobretudo quando potencializado com a técnica de CROLL modificada.

**Palavras-chave:** Lábio; Pesquisa e Novas Técnicas; Rejuvenescimento; Terapia a Laser

## Original article

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## INTRODUCTION

The aging process reduces collagen and elastin, resulting in significant changes in the face. In the perioral region, smoking can aggravate this condition. In this location, the changes seen in senescence are increased distance between the base of the nose and the lip, shortening of the visible mucosa surface with flattening of the lip and vertical wrinkles that originates from the vermilion, known as “barcode” lips. It is also worth mentioning the decrease in lip prominence due mainly to the resorption of the jaw bone and, sometimes, changes in the dentition.<sup>1,2</sup>

In general, with senility, the perioral region changes from a young three-dimensional protuberance to a flat, elongated, and two-dimensional structure.<sup>1,2</sup>

Countless factors contribute to the changes observed in this region aging, thus no therapeutic modality in isolation is described as a “gold standard”, capable of reversing the process, with a global improvement of the perioral region. The best treatment is the sum of several procedures that work synergistically, such as surgical techniques, fillers, botulinum toxin, dermabrasion, chemical peels, microneedling, and different types of lasers, which present quite satisfactory results.<sup>3</sup>

Fractional lasers are described as extremely effective in the treatment of this region, and, among them, those with the most significant scientific evidence are the ones using CO<sub>2</sub> or Erbium YAG. Despite having different wavelengths, they present a similar chromophore and the same target of action, promoting a significant collagen remodeling. In the literature, comparing the effectiveness between them is a real duel. Some authors advocate the idea of the superiority of the CO<sub>2</sub> laser, which is capable of causing more profound damage and better results despite the higher downtime. Others, however, believe in the greater effectiveness of the Erbium YAG laser, with the advantage of a shorter healing time.<sup>4,5</sup>

More recently, a new variety of Erbium Yag laser has been used. Although fractionated, they are non-ablative and performed with intraoral application. In this modality, the handle is inserted into the patient's oral cavity. The laser emanates its energy on the surface of the oral mucosa without damaging the skin surface, and is considered a safe, painless, and effective technique.<sup>6</sup>

For a better result of the perioral region rejuvenation, we propose to optimize the use of the ablative fractional CO<sub>2</sub>

laser enhanced with the application of the modified CROLL technique (surgical reconstruction with localized laser), located in the perioral rhytids. The CROLL technique was described in 2010 and is used to treat acne scars. It consists of reducing the equipment's spot, bringing the distance between the points closer and increasing the depth of the shots, optimizing the results and minimizing complications.<sup>7</sup>

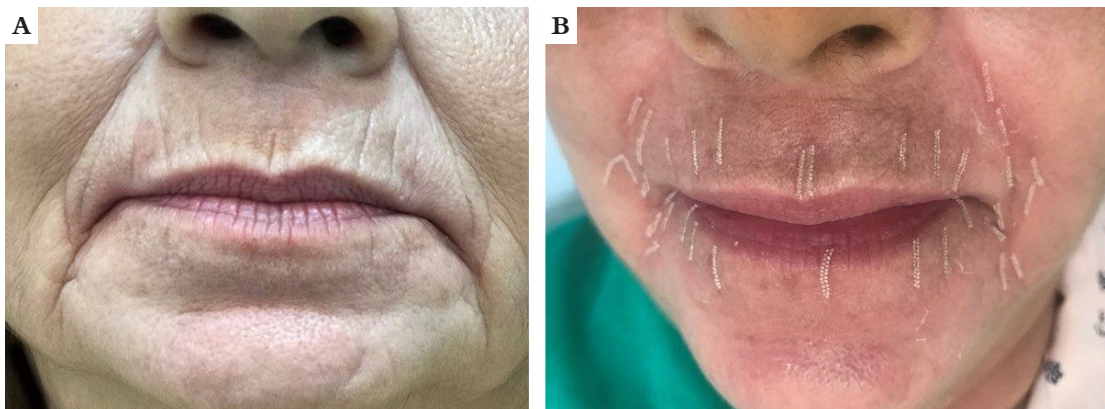
## METHODS

Twelve female patients, with ages varying between 50 and 68 years, with Fitzpatrick skin phototypes II to IV, from Belém (PA), were selected to receive the procedure. Besides presenting facial aging process, they haven't undergone previous rejuvenation treatments, and they had no comorbidities that compromised the procedure.

One month before the procedure, the patients started using sunscreen SPF 50 with color, associated with the manipulated formulation of tretinoin 0.03%, tranexamic acid 3%, hydroquinone 4%, and green tea 3%. On the day of the procedure, patients signed the free and informed consent form (ICF). Photographic documentation was performed, as well as asepsis with alcohol 70%. An hour before the procedure, they took a sublingual tablet of trometamol (Toragesic®, EMS, Brazil). Topical anesthesia was applied with the combination of tetracaine and lidocaine (Pliaglis®, Galderma, Brazil) occluded with gauze.

Anesthesia was then removed, and the procedure was conducted with the ablative fractional CO<sub>2</sub> laser (SmartXide, DEKA, Calenzano, Italy) associated with the chiller (Freddo, Fabbinject) in two stages. Initially, the laser was applied with the modified CROLL technique, located only on the perioral rhytids, that is, the equipment spot was directed linearly on the rhytids, with a distance between the points of 200µm and depth of 2000µs and 30w of power (Figure 1). Subsequently, the laser was applied to the entire face, including the area previously treated with the modified CROLL technique, but with lower parameters. We used a distance of 650µm between the points, with a depth of 1300 µs, energy of 15w and stack 2.

For ten days after the procedure, patients were instructed to use Cicaplast baume B5® (La Roche Posay), thermal water and to maintain color SPF 50 with color. After 10 days, the manipulated formulation was reintroduced until the day of the next procedure.



**FIGURE 1:** Patient 1.  
a) Pre-procedure;  
b) Immediate post-application of the modified CROLL technique in the perioral rhytids

The protocol was performed in three sessions, with an interval of 45 to 60 days. The analysis of the final result, with photographic documentation, was conducted 45 days after the last procedure.

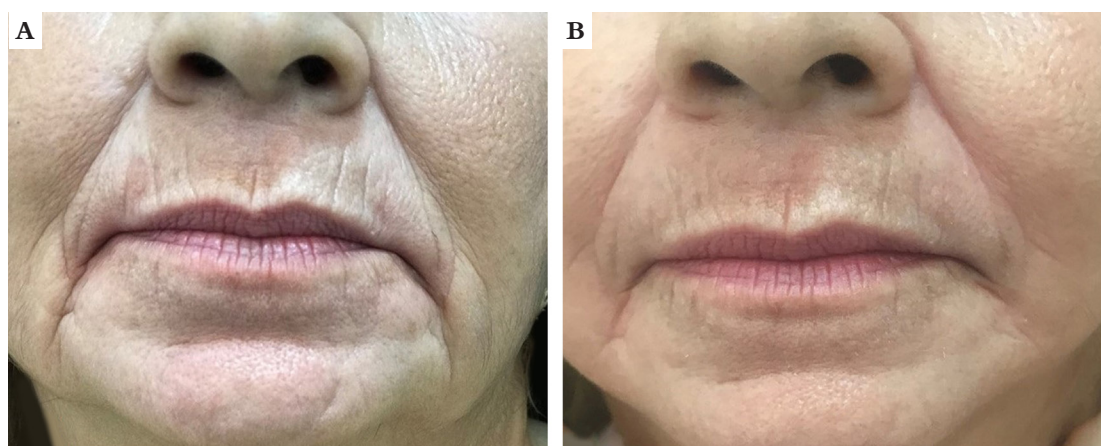
The work was guided according to the rules issued by the Declaration of Helsinki.

## RESULTS

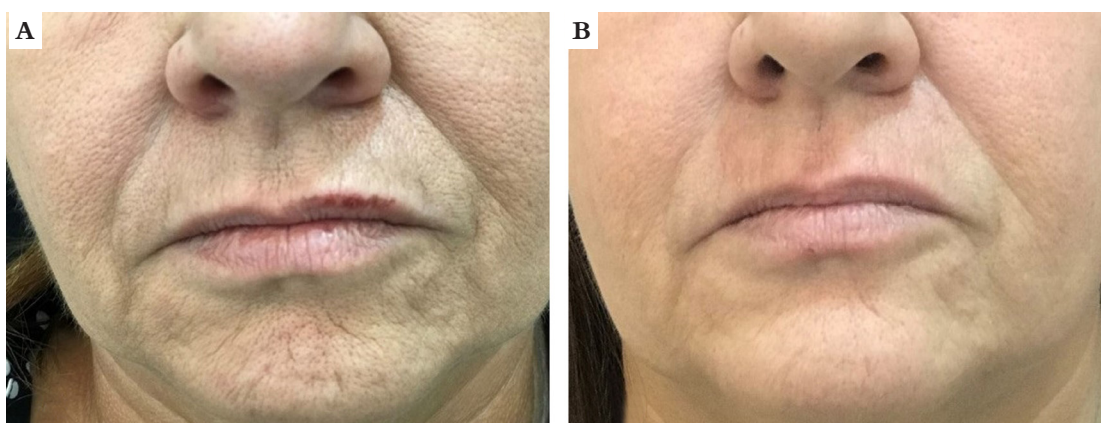
Patients treated with the proposed method obtained satisfactory results as early as the 10th day after the first CO<sub>2</sub> laser session. However, the best results were obtained 45 days after the third laser application (Figures 2, 3, and 4). On the day after

the application, the patients presented linear crusts located on the rhytids, where the modified CROLL technique was applied, associated with edema and global erythema of the face, which faded until the 4th day after the procedure (Figure 5), which is why the patients were removed from their usual activities during this period. We observed no hypo or hyperchromias after the procedures.

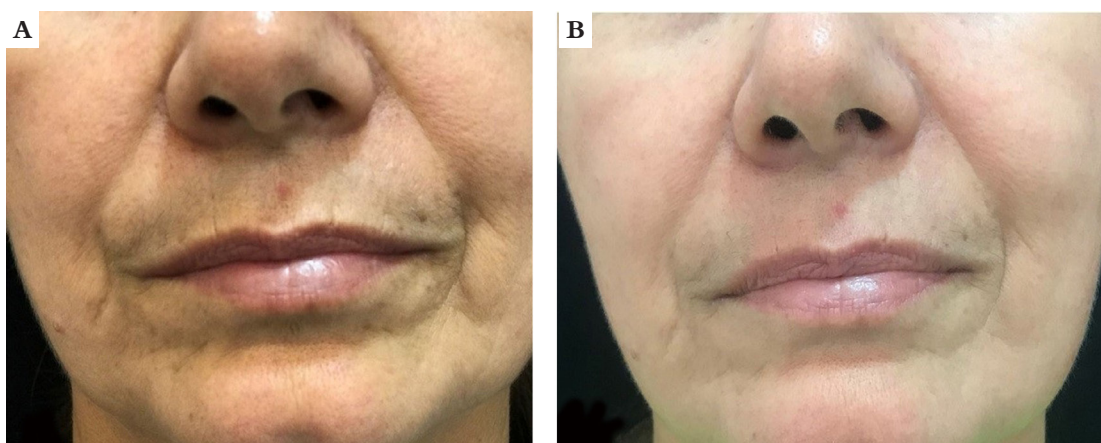
In the global analysis of the perioral region, we found that the rhytids were superficialized, and the elasticity was improved. The degree of patient satisfaction coincided with our clinical assessment and photographic records.



**FIGURE 2:** Patient 1, woman, 64 years.  
a) Before applying the procedure;  
b) 45 days after the application of the 3rd session of the CO<sub>2</sub> laser enhanced with the modified CROLL technique



**FIGURE 3:** Patient 2, woman, 59 years.  
a) Before applying the procedure;  
b) 45 days after the application of the 3rd session of the CO<sub>2</sub> laser enhanced with the modified CROLL technique



**FIGURE 4:** Patient 3, woman, 54 years.  
a) Before applying the procedure;  
b) 45 days after the application of the 3rd session of the CO<sub>2</sub> laser enhanced with the modified CROLL technique



## DISCUSSION

The perioral region's aging process is the result of numerous intrinsic and extrinsic factors, such as photodamage, loss of volume and elasticity of soft tissues, retraction of the redness of the lips, dental alteration, bone resorption, and smoking, among others.<sup>8,9,10</sup>

The changes observed in this area resulting from senescence are represented by fine perioral lines, flattening of the cupid's bow, and decreased lip prominence. The filter is poorly defined and longer, and the upper lip gets thinner.<sup>8</sup>

The perioral region treatment is a challenge with a lot of complexity, as it also depends on the individual and cultural concept of beauty.<sup>11</sup>

The literature mentions numerous techniques capable of minimizing the damage caused by aging in the perioral region. Surgical approaches, which can provide impressive results, are not the most chosen by professionals and patients because preference is for less invasive procedures, without a higher risk of scarring.<sup>6,12,13</sup>

Among the non-invasive procedures, many options can be used: chemical peels, dermabrasion, microneedling, fillers, botulinum toxin, biostimulators, lasers, etc., which favor improvement, but act in different ways. Because the causal factors of aging in the perioral region are multiple, the ideal therapeutic method is to associate various techniques with cohesive actions.<sup>8,10,14,15</sup>

Treatments with ablative lasers provide an important increase in collagen I and III, improving the appearance of the perioral complex. In clinical trials, the best results in this area are the Erbium YAG and CO<sub>2</sub> lasers. The comparative effectiveness between both varies between authors.

Some references describe that the Erbium YAG laser is superior, with the advantage of shorter recovery time. On the other hand, many authors report that the CO<sub>2</sub> laser is a powerful ablative weapon, capable of leading to more dramatic results for the perioral rhytids than those seen with the Erbium YAG laser.<sup>1,5,16</sup>

For more than two decades, the CO<sub>2</sub> laser has been used to treat facial rejuvenation, rhytids, acne scars, blepharoplasty, surgical removal of lesions, etc. Initially, in the form of ablative resurfacing, it led to many complications such as hypertrophic scars, persistent dyschromias, risk of infection, prolonged recovery time, and reasons for which it fell into disuse the 1990s. The emergence of fractionated CO<sub>2</sub> lasers, which lead to a faster recovery with fewer complications, provided the resumption of this technology in the medical therapeutic arsenal.<sup>7,17</sup>

The fractional CO<sub>2</sub> laser emanates its energy in thermal columns, which are called thermal microzones. This thermal injury leads to localized dermal necrosis with collagen denaturation. It is an area of healthy, unaffected skin around, stimulating the production of new collagen, with faster healing and better tolerated postoperative than traditional ablative resurfacing, providing significant tissue remodeling. Regarding the mechanism of action, thermal damage occurs by vaporization. In the first 48/72 hours, there is edema, release of chemical mediators, and shortening of collagen fibers, so it requires downtime in this period. The best results are observed 30 days after the procedure with the recruitment of fibroblasts, new dermal matrix, resolution of the inflammatory process, among others.<sup>17,18</sup>

The risk of hyperchromias is higher during the recovery period and may be a limiting factor described by some authors.<sup>17,18</sup> The CROLL technique aims to optimize results and minimize adverse events, using the fractional CO<sub>2</sub> laser in a localized way, only on acne scars, with intense parameters, providing expressive results, less discomfort and greater adherence to treatment.<sup>7</sup>

In this approach, to enhance the CO<sub>2</sub> laser's effectiveness, we used the modified CROLL technique. Instead of using it on acne scars, it was applied to the perioral rhytids, reducing the equipment spot, bringing the points closer, and increasing the shots' depth.

Further studies are necessary to consolidate the results. Still, the association of the modified CROLL technique located in the perioral rhytids and subsequent application of fractional



**FIGURE 5:** Patient 1 in the immediate post-procedure showing the linear crusts located in the perioral rhytids, where the modified CROLL technique was applied, associated with edema and global erythema of the face, aspects that faded until the 4th day after the procedure, which is why the patients were removed from their usual activities during this period

CO<sub>2</sub> laser across the face, including the area previously treated in a localized way, in this study, optimized the effectiveness of this therapeutic modality and provided entirely satisfactory results.

## CONCLUSION

Although the rejuvenating treatment of the perioral region has a better result with the association of techniques with a different mechanism of action, fractional lasers have excellent efficiency in this area and the CO<sub>2</sub> laser, even in isolation, has shown satisfactory results, especially when enhanced with the modified CROLL method. ●

## REFERENCES

1. Winslow C. Surgical and nonsurgical perioral/lip rejuvenation: beyond volume restoration. *Clin Plast Surg*. 2018;45(4):601-609.
2. Penna V, Stark GB, Voigt M, Mehlhorn A, Iblher N. Classification of the aging lips: a foundation for an integrated approach to perioral rejuvenation. *Aesthetic Plast Surg*. 2015;39(1):1-7.
3. Danhof RS, Cohen JL. A combination approach to perioral rejuvenation. *J Drugs Dermatol*. 2016;15(1):111-2.
4. Yalici-Armagan B, Elcin G. Fractional carbon dioxide laser for facial rejuvenation: a prospective study to evaluate the efficacy and the safety. *Plast Reconstr Surg*. 2019;143(1):64-74.
5. Sarnoff D, Gotkin R, Doerfler L, Gustafson C, Hanke CW. The safety of laser skin resurfacing with the microablative carbon dioxide laser and review of the literature. *J Drugs Dermatol*. 2018;17(11):1157-62.
6. Gaón NQ, Binfa F. Efeito do laser não ablativo Erbium YAG 2940nm intraoral no rejuvenescimento do lábio superior: estudo-piloto. *Surg Cosmet Dermatol* 2017;9(1):56-8.
7. Metelmann U, Machado Filho CD, Meireles SIFC, Teixeira LPVB. Técnica de Croll: cirurgia de reconstrução com laser localizado em cicatrizes de acne. *Surg Cosmet Dermatol*. 2010;2(4):336-9.
8. Wollina, U. Perioral rejuvenation: restoration of attractiveness in aging females by minimally invasive procedures. *Clinical Interventions in Aging* 2013;8:1149-55.
9. Leveque JL, Goubanova E. Influence of age on the lips and perioral skin. *Dermatology*. 2004;208(4):307-13.
10. Danhof RS, Cohen JL. A combination approach to perioral rejuvenation. *J Drugs Dermatol*. 2016;15(1):111-2.
11. Penna V, Stark GB, Voigt M, Mehlhorn A, Iblher N. Classification of the aging lips: a foundation for an integrated approach to perioral rejuvenation. *Aesthetic Plast Surg*. 2015;39(1):1-7.
12. Suzuki HS, Seidel GB, Soares VC, Hepp T, Helmer K. Tratamento cirúrgico da inversão labial do envelhecimento. *Surg Cosmet Dermatol*. 2014;6(3):282-3.
13. Tonnard PL, Verpaele AM, Ramaut LE, Blondeel PN. Aging of the upper lip: part II. Evidence-based rejuvenation of the upper lip - A review of 500 Consecutive Cases. *Plast Reconstr Surg*. 2019;143(5):1333-42.
14. Wu DC, Fitzpatrick RE. Facial rejuvenation via the sequential combined use of multiple laser modalities: safety and efficacy. *Lasers Surg Med*. 2016;48(6):577-83.
15. Glaser DA, Kurta A. Periorbital rejuvenation: overview of nonsurgical treatment options. *Facial Plast Surg Clin North Am*. 2016;24(2):145-52.
16. Sanniec K, Afrooz PN, Burns AJ. Long-term assessment of perioral rhytide correction with erbium: YAG laser resurfacing. *Plast Reconstr Surg*. 2019;143(1):64-74.
17. Alexiades-Armenakas M, Sarnoff D, Gotkin R, Sadick N. Multi-center clinical study and review of fractional ablative CO<sub>2</sub> laser resurfacing for the treatment of rhytides, photoaging, scars and striae. *J Drugs Dermatol*. 2011;10(4):352-62.
18. Yalici-Armagan B, Elcin G. Fractional carbon dioxide laser for facial rejuvenation: a prospective study to evaluate the efficacy and the safety. *J Cosmet Laser Ther*. 2018;20(1):2-8.

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Statistical analysis; approval of the final version of the manuscript; study design and planning; preparation and writing of the manuscript; data collection, analysis, and interpretation; active participation in research orientation; intellectual participation in propaedeutic and/or therapeutic conduct of studied cases; critical literature review; critical revision of the manuscript.