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Endolaser Technique Application without Using Anesthetic Substance for Treating Aesthetic Disorders: Clinical Experience in Brazil

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Abstract

Introduction: In Brazil, the use of subdermal laser technique is routinely associated with the use of anesthetics, mainly lidocaine used undiluted or in the form of Klein's tumescent solution. In our clinical practice, we chose to carry out most of the clinical care without using anesthetic substances, ensuring safety, relative comfort and excellent clinical results.

Objective: To describe the authors' clinical experience regarding the use of endolaser in Brazil for treating aesthetic conditions without the use of anesthetics.

Material and methods: This study is characterized by exploratory research presented through a narrative review, to highlight the foundations and criteria for the treatment of aesthetic dysfunctions using endolaser technique without the use of anesthetics. In addition to the bibliographical review, data relating to the authors' clinical experience using this technique were added to this study.

Results: We identified that using endolaser with low powers, pulsed mode with T.On of 50 ms and T.Off of 50 ms, controlled local energy accumulation, monitoring skin temperature by thermographic imaging and associating it with the tolerance and discomfort reported by the patient during treatment, makes the use of the endolaser without anesthetics viable and safe.

Conclusion: We concluded that using endolaser without anesthetics for treating aesthetic dysfunctions is viable, safe and effective, but requires attention to the use of lower dosimetric power and energy levels, and also to monitoring skin temperature during the procedure.

Key-words: endolaser, endolift, anesthetic, lidocaine, Klein's solution.

Introduction

The endolaser subdermal technique used in purely aesthetic procedures, has as one of its main characteristics the use of equipment that emits wavelengths of 1470 nm and 980 nm [1]. Laser radiation is transmitted through an optical fiber directly inserted into the superficial subcutaneous tissue [2-5]. This subdermal laser therapy technique aims to create heat inside the tissues to damage the subcutaneous adipose tissue [6-8] and/or heat the skin to stimulate collagen production [3, 9-11].

The endolaser can be used in various aesthetic conditions on the face, including aging and sagging skin, rosacea, acne vulgaris, acne scars, etc. In the body, lipodystrophies such as localized adiposities and cellulite are the conditions most treated with this technique [6, 7, 12-16].

The use of local anesthetics in dermatology, aesthetic medicine and plastic surgery is widely described in the literature [17]. And in the case of using subdermal laser, its use began to be described through the surgical technique of Laser Assisted Liposuction (LAL), where the optical fiber transmitting the laser was inserted inside a cannula with aspiration potential, as this technique was associated with traditional liposuction [18]. This surgical technique evolved into the laser lipolysis technique in which there was no use of liposuction measures, however the use of local anesthetics was similar to the conventional aspiration technique, mainly with the use of a tumescent solution based on lidocaine [19- 22].

The subdermal laser technique evolved to use bare optical fiber without using cannulas, with or no

aspiration potential, and in 2005 the Endolift™ method (LASEMAR1500™ machine, Eufoton s.r.l.) appeared, developed by an Italian doctor called Roberto Dell'Avanzato, who provided care to more than 4,000 patients using a diode laser with a wavelength of 1470 nm. The technique was also known as the "Dell'Avanzato Technique" [23]. Authors reported that this technique was performed using local anesthetics to provide comfort during the procedure [5, 7, 11, 24, 25], however several studies have also been published describing the procedure without administering any types of anesthetics [2, 13, 23, 26, 27].

In Brazil, the utilization of subdermal endolaser is routinely associated with the use of anesthetics, mainly lidocaine, used undiluted or in the form of a tumescent Klein solution [4, 8, 28].

In our clinical practice, we chose to carry out most treatments without the use of anesthetic substances, ensuring safety, relative comfort and excellent clinical results. Therefore, this study aimed to describe the authors' clinical experience regarding the use of the endolaser in Brazil for the treatment of aesthetic conditions without the use of anesthetics.

Methodology

This study is characterized by exploratory research, presented through a narrative review to highlight the foundations and criteria for the treatment of aesthetic dysfunctions using the endolaser technique without using anesthetics. The review explored scientific articles, published and available in the following databases: MEDLINE (Medical Literature Analysis and Retrieval System Online), PubMed (National Library of Medicine), SCIELO (Scientific Electronic Library Online), LILACS (Latin American and Caribbean Literature in Health Sciences) and Google Scholar.

As an inclusion criterion, sources that described the use of subdermal laser without liposuction and that mentioned the use or not of any form of anesthetic technique were selected. Sources that did not present an abstract, those that were not allocated to scientific journals and did not address the topic of the study, as well as those that did not support the collection of reliable data were discarded. The bibliographic survey was conducted in Portuguese, English, Spanish and Italian, using the following descriptors: endolaser, endolift, anesthetic, lidocaine, Klein solution.

In addition to the bibliographic review, data regarding the authors' clinical experience of using endolaser technique used in Brazil for the treatment of aesthetic dysfunctions without the use of anesthetics were added to this study.

Results and Discussion

1. Anesthetic techniques

According to Dell"Avanzato, the Endolift™ (LASEMAR1500™ machine, Eufoton s.r.l.) is normally performed without anesthesia, but when treating particularly sensitive areas, an air cooling system can be used directly on the skin, as well as anesthesia of the patient's choice. operator. Only in selected cases, where the use of larger diameter fibers is better, is the use of local anesthesia with lidocaine preferred. The infiltration of an anesthetic agent should never be excessive, once a considerable amount of liquid penetrating the tissues can cause heat dispersion and, therefore, alter the photothermal effect of the laser [2].

Lidocaine is a local anesthetic commonly used for minimally invasive procedures in the subcutaneous and intradermal layer [29]. This way, lidocaine can be directly administered to the incision site for the endolaser procedure.

Another way of anesthesia commonly used in subdermal laser procedures is Klein's Tumescent Solution. Tumescent lidocaine anesthesia (TLA) was developed by Jeffrey Klein in 1987 to entirely perform liposuction by local anesthesia, with virtually no surgical blood loss [30, 31]. This technique involves subcutaneous infiltration of a large volume of a saline solution containing a low concentration of lidocaine, epinephrine and sodium bicarbonate for anesthetic and hemostatic purposes [32].

In Table 1 some examples of Klein's solution described by authors over a few years are shown. There has been an evolution regarding the presentation of lidocaine and a lack of standardization regarding the amount of sodium bicarbonate.

Klein's tumescent solution is considered a safe technique for outpatient procedures. It is widely described that the maximum dose limit of lidocaine is 7mg for each kg of body weight,

however this parameter does not apply to local tumescent anesthesia in adipose tissue using Klein's solution, as its use reduces the availability of systemic of the anesthetic [33]. In 1990, the safe concentration limit for lidocaine proposed when used in Klein's solution was 35mg/kg, that is, 5 times above the conventional level (7mg/kg) [34], however in 2016, authors [35] defined dosages as maximum safe lidocaine in Klein's tumescence at 28 mg/kg without liposuction and 45 mg/kg with liposuction.

Sterile 0.9% Saline Solution	Lidocaine	Adrenaline 1:1000	Sodium Bicarbonate 8.4%	References
1000 mL	**50 to 100 mL at 1% (with vasoconstrictor)**	**--**	**12,5 mL (12 mEq)**	Klein, 1990 [32]
1000 mL	**50 mL at 1%**	**1 mL**	**10 mL (10 mEq)**	Klein, 1999 [36]
1000 mL	**25 mL at 2%**	**1 mL**	**8 mL (8 mEq)**	Bolletta et al., 2019 [37]
1000 mL	**25 mL at 2%**	**1 mL**	**8 mL (8 mEq)**	Trignano et al, 2023 [38]
5 mL	**15mL at 2% (with vase)**	**--**	**2 mL**	Quintero & Suarez, 2023[39]

Table 1. Comparison between some Klein solution formulations.

The use of topical anesthetics is also mentioned as an effective measure for the use of subdermal lasers.

Authors [40] reported the use of topical anesthetic to carry out research involving 20 patients with horizontal wrinkles on the neck, aged between 30 and 50 years. The volunteers were divided into two treatment groups: in one group, horizontal wrinkles on the neck were treated with a combination of the Endolift subdermal laser technique associated with the Nanofat autologous fat grafting technique (lipid substance containing tissue stromal vascular fraction (t- SVF) and adipose tissue-derived stem cells (ASCs). And, in the other group, horizontal neck wrinkles were treated with the Nanofat technique alone. Anesthetic treatment methods included the use lidocaine cream (10, 56%) and local lidocaine (HCI 2%) topical application, and epinephrine infiltration (1:1,000,000) or sedation. Using each of these techniques was adopted based on the patient's preference. The Nanofat technique showed better aesthetic results in neck wrinkles.

Ilaria et al. [41] reported a treatment protocol with the administration of a 1470nm diode laser, associated with the injection of a hybrid filler, specifically calcium hydroxyapatite (CaHA), occurring 30 days after laser treatment. Before each procedure, the area of skin to be treated was prepared by applying a local anesthetic cream containing 5% lidocaine, 30 minutes before beginning the procedure. This anesthetic cream was completely removed immediately before starting treatment.

2. Adjustable parameters in endolaser

Dosimetric parameters are extremely important for the effectiveness and safety of the endolaser without anesthesia. Besides the power, in order to generate therapeutic heat, the continuous or pulsed mode of laser emission are determined, as well as the total energy accumulated in Joules.

In the traditional endolaser technique using anesthesia, the continuous mode is preferable to quickly reach the accumulated energy dose (in joules) and has a high capacity for damaging the tissue. Authors have recommended its use for the treatment of body conditions that involve both skin and subcutaneous tissue. But it can even be used with some safety in submental fat and in the cheek region (middle 1/3 of the face), as long as it is possible to control the speed of energy accumulation and local temperature [42].

In pulsed mode, energy accumulation is slower, allowing greater control over the increase in temperature, generating greater safety. It is normally indicated for treating aesthetic disorders involving face skin, as it can result in less damage in adjacent tissue to the target site of laser irradiation, especially to nervous structures [42].

We chose this mode as ideal for the endolaser without anesthesia.

When using pulsed mode, some parameters must be adjusted such as: Pulse duration (T.On) and interval between them (T.Off), frequency or pulse repetition rate, and Duty Cycle. However, this depends on the model of equipment being utilized. In our clinical practice, we use equipment that when opting for pulsed mode, we were only able to adjust the T.On and T.Off.

The pulse duration is measured in time units and regarding endolaser, most equipment adjusts the pulse duration in milliseconds or microseconds, therefore the right adjustment of the pulse duration, allowing adequate thermal relaxation. These associated with power adjustment are crucial to avoid abnormal thermal injuries and ensure good results in facial treatments with endolaser. Frequency is measured in Hertz and is characterized by the number of pulses (or cycles) per second and therefore, is also associated with pulsed mode in some equipment. Furthermore, frequency adjustment can be used as a safety item to avoid excessive energy accumulation causing injuries. It is commonly associated with adjusting the duty cycle and/or pulse duration. The Duty Cycle setting is the useful proportion of the laser beam (%) during which the laser is transmitted by the equipment in pulsed mode. Also, Duty Cycle is not commonly found in endolaser equipment [42].

3. Endolaser without anesthesia

The endolaser procedure without anesthesia is a technique that has been used in some specific cases [2, 13, 23, 26, 27]. In this protocol, the laser is directly applied to the target tissue without the administration of local anesthesia, which we believe, could offer some advantages such as improving visibility and perception of the treatment. In other words, we could have the patient's report regarding sensitivity if the fiber passes close to nerves and vessels, thus reducing the risk of injury, especially nerve damage. Furthermore, the time spent on the treatment can be shorter, as there will be no administration of the anesthetic, which may often require more time for the procedure and. In addition, direct laser action on the tissues might also reduce the treatment time since the increase in local temperature may occur more quickly due to the absence of anesthetic solution, as there would be a smaller number of substances to be heated at the site of laser application.

In the present study, we will describe our clinical practice in Brazil using the endolaser without anesthetics to desensitize the treated region. The services were carried out at the E*loiza Zimmer Beauty Academy* clinic, located in the city of Cuiabá-MT, and the equipment used was the Endolaser S1-K12, manufactured by Pioon Brasil, with a wavelength of 1470 nm.

The authors' clinical practice with the endolaser without anesthetics took place from May 2023 to July 2024 when treating cases of sagging facial and body skin, as well as facial aging and localized fat reduction, totaling around 180 patients treated. When carrying out services, we prioritized the use of lower powers, especially on the face, we always opted for the pulsed mode of energy emission (T.On 50ms and T.Off 50 ms). In addition to greater control over the energy deposit and the skin temperature, using a thermographic camera. Discomfort during the procedure was managed based on the subjective sensation of pain reported by the patient, so we changed the dosimetric parameters initially stipulated so that the patient could tolerate the procedure. As for the thickness of the optical fiber, on the face we used a 400-micron fiber and on the body a 600 microns fiber.

Our methodology is corroborated by Dell'Avanzato [2], who used the subdermal laser without anesthesia in lower eyelids. In our clinical practice we also do not use any type of topical anesthetic, where the Endolift® procedure was performed with a 200-micron thick second-generation bare fiber connected to a 1470 nm semiconductor laser. to treat the lower eyelids of a 43-year-old patient with wrinkles and sagging skin. The fiber was easily inserted through the skin without any incision, directly between the orbicularis oculi muscle and the septum. The total laser energy delivered was 80 J to each side. After the procedure, the patient immediately resumed her daily activities [2].

We adopt basic procedures in our clinical practice before starting to use the endolaser. First, we perform local antisepsis with neutral soap and 70% alcohol. Next, we make a mark on the skin delimiting the area to be treated, and we distribute

the vectors by adopting 1 cm between them (most distal part). Then, we inject a small amount of 2% lidocaine without vasoconstrictor into the skin to create an anesthetic button for the creation of the orifice in order to introduce the optical fiber (this is the only situation in which anesthetic is used in our procedure, however, it is not able of providing any type of local desensitization for performing the endolaser, which is why the technique is considered without anesthesia).

Several authors have also described their clinical practice with subdermal laser without the use of anesthetic such as in acne scars [13], in facial and body lifting (associated with microfocused ultrasound) [23], in sagging skin in the lower third of the face (associated with photobiomodulation) [26], and for the treatment of eye bags [27].

Below, we described six clinical cases treated with the use of endolaser without an anesthetic substance, excepting at the moment of creating the anesthetic button (minimum amount of lidocaine). The power and accumulated energy parameters were determined according to the target area and therapeutic objective. All patients were fully informed about the risks and discomfort associated with the procedure without anesthesia and gave their informed consent to participate in the study.

3.1 Clinical cases

Case 1: Patient, female, 70 years old, undergoing treatment for infraorbital bags and upper eyelid lifting. A power of 2 Watts was used, pulsed mode, 50ms on and 50ms off. Total energy accumulated in the upper eyelid of 40 Joules and in the lower eyelid 60 Joules, totaling 100 Joules of energy accumulated on each side (Figure 1).

Figure 1. Result after two months from the first endolaser session without anesthesia. It is possible to notice the improvement in the aesthetic appearance with the reduction of bags in the lower eyelids, as well as the improvement in sagging skin and lifting of the upper eyelid.

Case 2: Female patient, 84 years old, undergoing treatment for infraorbital bags in the lower eyelids and face lifting. It used 2 Watts power, pulsed mode, 50ms on and 50ms off. Total energy accumulated in the lower eyelid was 60 Joules on each side, while in the face lift the energy accumulated was 840 Joules on each hemiface (Figure 2).

Figure 2. Result after two months from the first endolaser session without anesthesia. It is possible

to note complete reduction of the lower eyelid bag, as well as the improvement in sagging skin on the face and neck. In addition, there was a reduction in the nasolabial fold and "marionette" wrinkle resulting from the face lift.

Case 3: Patient, female, 65-years-old, undergoing treatment for sagging skin on the face, eyelids and neck. Power of 2 Watts, pulsed mode, 50ms on and 50ms off, was used on the hemiface and eyelid regions. The energy accumulated in each hemiface was 1,120 Joules, and the total energy accumulated in the upper eyelid was 40 Joules and in the lower eyelid 60 Joules (100 Joules of energy accumulated on each side). In the neck region, a power of 3 Watts was used, pulsed mode 50ms on and 50ms off and accumulated energy of 600 Joules (Figure 3).

Figure 3. Result after two months from the first endolaser session without anesthesia. We may notice the improvement in skin quality, reduction of sagging in the middle and lower third of the face, upper and lower eyelids, and neck. Furthermore, there was a reduction in the nasolabial fold and lifting of the lip commissure due to the indirect effect of the face lift.

Case 4 - Patient, female, 43 years old, undergoing treatment to reduce fat located on the flanks. A power of 6 Watts was used, pulsed mode, 50ms on and 50ms off. For this body region, we divided the part of each flank into two quadrants, anterior and posterior, totaling an area of 60 cm² on each flank. The accumulated energy on each side was 1,200 Joules (Figure 4).

Figure 4. Result after two months from the first endolaser session. In the image it is possible to notice fat located reduction in the flank region. In this case we also observed an improvement in skin sagging in the same region and a more accentuated waistline.

Case 5 - Patient, female, 52 years old, undergoing treatment for sagging in the abdominal region after liposuction. A power of 7 Watts was used, pulsed mode, 50ms on and 50ms off, and the accumulated energy was 8,000 Joules throughout the abdominal region; vectors were distributed in 4 quadrants of 100 cm2. Although, in this case, the application was on the body, we passed the optical fiber throughout the region in a "just dermal" manner, that is, very close to the skin (Figure 5).

Figure 5. Result after two months from the first endolaser session without anesthesia. In the image it is possible to see an improvement in sagging skin in the upper and lower abdomen, which resulted in the lifting of the umbilical scar. In

addition, we noticed a lightening of the skin in the entire region subjected to Endolaser treatment.

Case 6: Patient, female, 62 years old, undergoing treatment for sagging on the face and submental region. A power of 2 Watts was used on the face, pulsed mode, 50ms on and 50ms off, and the accumulated energy was 980 Joules on each hemiface. In the submental region, the power used was 3 Watts, pulsed mode, 50ms on and 50ms off, and accumulated energy of 600 Joules (Figure 6).

Figure 6. Result after two months from the first endolaser session without anesthetic. It is noticed the improvement in the skin quality of the entire face. There is a reduction in skin sagging, an improvement in the aesthetic appearance of the upper and lower eyelids, as well as an improvement in the pre-jowl region (reduction in the "marionette line"). Furthermore, there was a reduction in fat and sagging skin in the submental region.

For all cases described here, we used the dosimetric methodology described by Borges et al. [42] in which we calculated the size of the treating area and multiplied the value by 20 Jules in order to determine the total energy accumulated in each area or subareas. Furthermore, we monitored the temperature with the thermographic camera, prioritizing the safety temperature described by some authors [43]. On the face, eyelids and neck the temperature fluctuated between 37-39 degrees, and in the body area both for reducing fat and improving sagging, the skin temperature fluctuated between 39-42 degrees.

In all cases, we associated the temperature reached with the tolerance and discomfort reported by the patient during the treatment, aiming to adjust the procedure ensuring safety and effectiveness. Therefore, during each service, if there was any report of discomfort by the patient, we changed the vector we were applying after 5 passes with the optical fiber. After covering the entire vector area, we returned to the initial vectors to complete the energy deposit initially calculated for each vector, so patients reported being more tolerable when receiving endolaser treatment without adding anesthetic substances.

Still on monitoring temperature and discomfort, it was also observed that the temperature kept increasing even after changing the application vector, so the longer the time in each vector, the greater the discomfort reported by the patient, and thus greater the chance of burns. Therefore, it is important to monitor and maintain the recommended temperature for safe results, avoiding complications.

During the procedures, we prioritized the retro withdraw movement with the optical fiber in all clinical cases in the present study, as the use of the "back and forth" movement generates a very quick increase in temperature and consequently a lot of local pain, making the endolaser without anesthetic something insufferable.

After the end of endolaser procedure, we injected 10mL of medical ozone at 10 micrograms of concentration into each pertuitous where the optical fiber was introduced to control post-procedure pain and inflammation and avoid site of infection. Next, we plugged the wound with a bandage and applied adhesive elastic bands, like kinesio taping, adjusting the compression to produce "draining" and skin positioning effects. We advised patients to remain with the kinesio taping bands for approximately three days.

We also recommend on average 3 lymphatic drainage sessions for body treatment patients, starting on the fourth day. Although it is not common in our clinical practice, this may also be indicated for facial care patients in cases of significant edema.

We have seen in our clinical practice that, with the anesthetic techniques commonly used in the endolaser procedure, mainly with Klein's

tumescent solution, there is greater post-endolaser edema and there may be a need for aspiration of excess fluid or post-procedure drainage. In addition, a longer recovery time is also common. Without using anesthesia, we found a faster recovery, reducing post-treatment adversities. Furthermore, we understand that without a large amount of anesthetic liquid at the treatment site, we might have direct laser action on the tissues, which could justify the results using lower power and energy levels.

Conclusion

In this study, the laser was directly applied to the target tissue without administration of local anesthesia, which offered some advantages such as reduced costs associated with anesthesia, elimination of side effects of anesthetics, greater safety in the procedure and greater time savings during the treatment.

The results of endolaser without anesthesia may vary according to each patient, since the absence of anesthesia can result in mild to moderate discomfort during the treatment, making the procedure more difficult or not, but in our clinical practice we have seen that it was well tolerated by patients. In addition, performing endolaser without anesthesia also allowed treating more areas in the same session, since the anesthetizing procedure requires more time during the treatment.

We therefore conclude that the use of endolaser without anesthetics for the treatment of aesthetic dysfunctions is safe and effective but requires attention to the use of lower dosimetric levels of power and energy, pulsed mode of laser emission, and also in monitoring skin temperature during the procedure. Added to this is the identification and respect for the subjective feelings of discomfort reported by the patient during treatment to adopt the most appropriate treatment methodology for each case.

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