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Case Study

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The efficacy of two wavelengths in the Endolifting® technique - case study

Abstract

Objective: To present the effectiveness of the Endolifting® technique, also known as Endolaser, using a high-power diode laser with dual wavelengths of 980nm and 1470nm. Work based on an extensive review of the literature and illustrated by two clinical cases. The aim of this type of treatment is to reduce subcutaneous fat while toning the skin through neocollagenesis, offering a non-surgical alternative for both facial and body remodeling.

Case report: We present the use of the Endolifting® technique with a dual-wavelength diode laser for facial and body remodeling aimed at weight loss with concomitant tissue toning. Two patients, a man 43 years and a woman 37 years, complaining of localized fat and sagging were treated with laser Endolifting® respectively, in the jowl and abdomen areas, both underwent just one treatment session and returned for follow-up with an interval of 60 days between sessions. After the treatment, a more balanced and rejuvenated facial profile and a slimmer, more defined abdomen were observed. Both patients reported great satisfaction with the results.

Conclusion: This case report, based on scientific literature, confirms the Endolifting® technique using the dual wavelength diode laser 980 and 1470nm for the reduction of both facial and body fat, proving to be an excellent alternative due to its effectiveness, safety, minimum recovery time, low cost and reproducibility.

Keywords: Endolifting®, endolaser, laser lipólisis laser de diodo, endolifit

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Clinical case report

Initial patient assessment: Two patients were selected, both complaining of localized fat and sagging. One was a 43-year-old male patient who complained of aesthetic dissatisfaction with his double chin, and the other was a 37-year-old female patient who complained of abdominal fat and sagging. The patients were properly informed about the procedure and, upon agreeing to it, signed an informed consent form (ICF). They then underwent a complete clinical evaluation, including medical history, physical examination, standardized photographs for initial documentation, and comparison 60 days after treatment.

Clinical case report: Patients underwent a just one session of Endolifting® for treatment of regions submandibular and abdominal, was 600 micron optical fiber and power ranging from 8 to 10 W are used, in continuous mode with the dual wavelength high power diode laser with the, Figure 1, LASER TR-E equipment TRIANGEL RSD LIMITED Dual wavelength 980nm (30W) +1470nm (17w). The procedure was performed in an outpatient setting. The laser was applied to the lower third of the face and submandibular region, and to the abdominal region directing the energy to the subcutaneous fat. The Endolifting® technique was used to promote fat reduction in the desired regions and, simultaneously, provide additional structural support to the skin and underlying tissues, contributing to the reduction of sagging. Patients remained with a compression bandage for 7 days and, after this period, underwent 5 manual lymphatic drainage sessions that were performed once a week in the treated region. After 60 days, patients returned for clinical evaluations and photographic follow-up, which were performed to monitor the results and adjust the protocol, if necessary.

Evaluation of results: The effectiveness of the treatment was assessed by clinical analysis and comparison of photographs before and after the procedure and the level of patient satisfaction. A reduction in submandibular fat and an improvement in the facial profile were observed, showing a more balanced and rejuvenated contour of the face. Figure 2 a) Front view before and after 60 days, b) Right lateral view before and after 60 days, c) Left lateral view before and after 60 days of the procedure. Likewise, an improvement in body contour was observed with a notable reduction in abdominal fat and sagging. Figure 3 a) Front view before and after 60 days, b) Right lateral view before and after 60 days, c) Left lateral view before and after 60 days of the procedure. Both patients reported significant satisfaction with the results, highlighting a substantial improvement in their self-esteem and self-image.

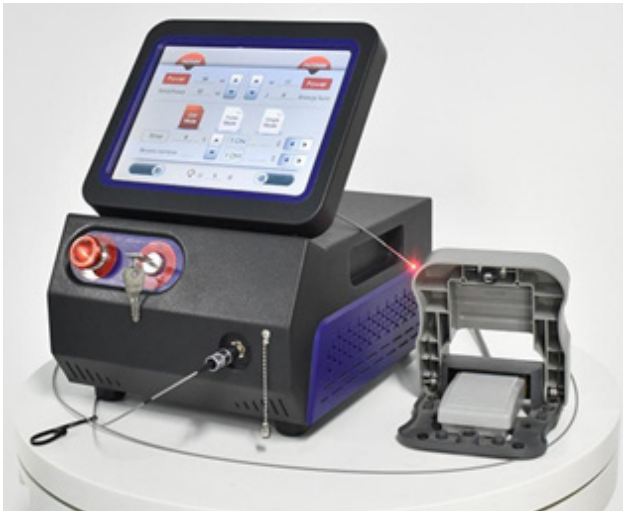

Figure 1 Laser TR-E Triangel RSD Limited Dual wavelength 980nm (30W) +1470nm (17w).

Figure 2 Front view (a), right side (b) and left side (c) view pre and after 60 days of the procedure.

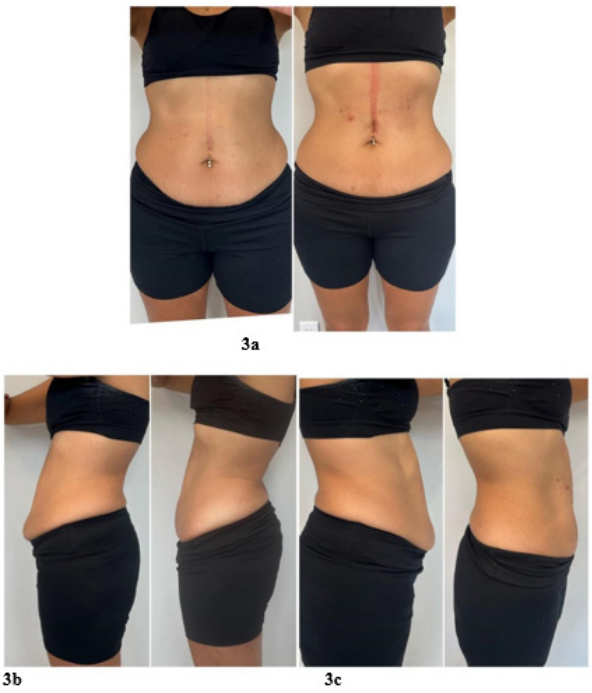

Figure 3 Front view (a), right side (b) and left side (c) view pre and after 60 days of the procedure.

Introduction

The increase in life expectancy is accompanied by a greater concern with appearance and the concomitant search for less invasive aesthetic treatments to delay and minimize signs of aging, without the need to reduce the current accelerated pace of life.[1] Until the beginning of the millennium it was difficult to see how to achieve a good cosmetic result without surgery.[1] One of the biggest challenges in aesthetic medicine is eliminating fat while achieving tissue retraction, especially today when patients are increasingly seeking non-surgical and minimally invasive procedures. To meet this need, laser treatments have emerged and evolved.[3] Since it was only after the introduction of the latest generation fiber lasers that we were able to truly achieve excellent results.[2,4,5]

In fact, the effects that patients seek in laser treatment are mainly the reduction of skin sagging, but also the reduction of fat deposits by laser lipolysis, if necessary.[3] Excess subcutaneous fat not only affects your appearance, but can also contribute to health risks such as obesity, type 2 diabetes, and cardiovascular disease. Endolaser technology has emerged as a promising alternative for localized fat reduction, offering a minimally invasive approach that can achieve desirable results.[3]

In recent years, the laser has become one of the most important innovations in medicine and surgery.[1,4] It has several clinical indications, including aesthetic ones, thanks to devices and techniques that are now more easily reproducible, safer and minimally invasive.[5,6] Surgical options have disadvantages, such as the use of anesthetics, swelling, pain and long recovery time, so there is a growing demand from the public for techniques with fewer side effects and shorter recovery periods,[7,8,9] treatments with lower cost and, most importantly, minimal risks.[6,8]

Laser therapy is a new, non-invasive technique that can lyse excess fat without the adverse side effects associated with surgical procedures such as liposuction.[1,8] Non-invasive laser improves the appearance of the body by eliminating excess adipose tissue, specifically in areas where fat persists despite diet and exercise.[7] The use of devices with laser technology contributes to the procedure through lipolysis and skin retraction stimulation,[7,10] both immediate and delayed, by stimulating collagen.[11,12]

The technique was initially described using diode and ND: Yag lasers with wavelengths ranging from 920nm to 1440nm.[13,14] The evolution of the endolaser technique stopped being used as a liposuction instrument and started to be used only as laser therapy through optical fiber, and allowed its expansion to several outpatient clinics and professionals, this enabled its popularization in Brazil,[12,15] so the technique became less aggressive, but maintained its effectiveness in reducing subcutaneous tissue and toning the skin.[14,15] Endolaser emerges as one of the main options that can transform the practice of the aesthetic professional.[3]

In 2022, the Endolifiting® technique arrived and became popular in Brazil, due to its excellent clinical results with the use of the 1470nm diode laser in combination with the Endolifting® technique for reducing facial fat.[1,12,15,16] The Endolifting® technique, also known as Endolaser or Endolift, consists of the use of a laser beam with a wavelength of 1470 nm emitted through an optical fiber inserted into the subdermal tissue with the aim of reducing subcutaneous fat and toning the skin through intense collagen production.[1,12,15,16]

This fiber is inserted under the skin for the time necessary to deliver the laser energy directly to the subcutaneous layer, without having to pass through the superficial layers of the skin (epidermis and dermis). This is one of the many advantages that the procedure has over its counterparts, such as radiofrequency or transdermal lasers, which deliver energy, in addition to causing increased pain.[1,2,4,6,15–17] This procedure has the advantage of being able to be applied to any skin phototype, since the laser acts below the skin.[10,11] Among the advantages: only local anesthesia, no incisions, fast treatment due to immediate fat emulsion, limited thermal damage to neighboring

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tissues, different sterile fibers, fast recovery for work activities, visible results after one session.[4] Anatomophysiological knowledge is essential for the application of the technique, as well as acting with appropriate parameters in order to avoid possible complications and promote superior advantages in the area of aesthetic dermatology.[3] Endolaser technology offers the benefit of the evolution in aesthetic treatments with fast and unparalleled results in a safe and comfortable way.[3]

The mechanism of action of the subcutaneous laser is twofold; acoustic/ mechanical and selective by photothermolysis of the target tissue.[1,3–5] The main characteristic of this laser is precisely the selective absorption of this wavelength (λ) by water and adipose tissue, and is therefore used for remodeling, by heating both the collagen structure of the superficial dermis and the connective tissue structure present in the adipose compartments of the subcutaneous tissue.[1,4,18]

Once absorbed by chromophores, light can cause three basic effects: photothermal, photochemical and photomechanical.[3,4,13] It was demonstrated by a mathematical model that the photothermal effect of the endolaser technique can occur when the temperature reaches 48 to 50oC inside the tissues (0.8 cm below the dermis) while on the surface of the skin the maximum temperature reaches 41oC.[14] This photothermal stimulation through heat production generates cellular damage to adipocytes and leads to the remodeling of skin collagen,[4,14,9,19] due to controlled stress on fat cells, inducing lipolysis and subsequently after a period of laser exposure.[3] The effect of lipolysis improves the removal of adipose tissue and the breakdown and coagulation of collagen can lead to the creation of a new, thicker and more organized reticular dermis, with the clinical results of slimmer skin and reduced sagging.[11,12] When applied to the subcutaneous and deep dermis region, the laser has a photochemical action (alteration of adipocyte membrane permeability).[4,9,19] Low energy at 980nm increases adipocyte size to 100Mc. The heat generated by the laser alters the balance of sodium and potassium in the cell membrane, which leads to the passage of extracellular fluid into the intracellular space.[13]

Sagging skin in the face, neck and body areas can fully benefit from intratissue laser to reshape the skin, stimulate neocollagenesis and, due to the 1470 nm wavelength, interact with water in the skin, resulting in a visible and long-lasting "lifting effect".[2,4,6,14] Endolift retracts and remodels the tissues, increases collagen production and stimulates neoangiogenesis, resulting in an overall skin compaction that continues to progress over the following months of treatment.[2] When there is also extra fat in the treated area, changing the position of the laser causes the selective absorption of the laser beam by the adipose tissue to create emulsification of the fat.[4]

The Endolifiting® technique which presents itself as a viable, safe and replicable solution for patients seeking to reduce fat and sagging skin on both the face and body.[15,16] In addition, this technique is comfortable, as it uses local anesthesia and a shorter procedure time and recovery time. Added to this, it is safer, as it uses a path that minimizes areas at risk of nerve damage.[16]

This article is innovative, as it is the first time that the Endolifting® technique is presented with the modification of the protocol to "dual-wave" using a high-power diode laser device with dual wavelengths, 980nm and 1.470nm, providing even more effectiveness in fat reduction and tissue recompactation both in the abdominal and double chin regions. The advantage of working with dual wave technology is that the operation is more precise for each intentional procedure.[3,17,20]

Discussion

Increasingly, patients are seeking outpatient procedures that can provide results comparable to those of plastic surgery, but without the risks and possible complications associated with surgery. The introduction of state-of-the-art fiber optic lasers has made it possible to achieve remarkable results, something that was difficult to conceive of in previous years.[1,3,17] Lasers have been used for fat reduction in recent years.[17,18] Over the past 20 years, several studies have been published on laser liposculpture, and in 2006, the FDA demonstrated that approximately 50% of 2.200 subjects reported greater 'skin tightening' after laser liposuction than patients treated with traditional liposuction.[6] The application of laser in the liposuction procedure promotes a reduction in mechanical trauma to the surrounding tissues, which results in less stimulation of the formation of fibrosis, with reduced bleeding due to the coagulation of blood vessels, favoring postoperative comfort, with less pain and faster recovery. In addition, there is marked tissue retraction, both immediate and late, due to the stimulation of collagen, which is better evaluated after the third month postoperatively.[21,22] Thus, the use of lasers for the removal of adipose tissue has been noted in recent years through reports that explain the use of equipment being used in a non-invasive way.[7] More recently, it has been reported that laser therapy can be used as a non-invasive body fat contouring technique.[6,14,18,23]

The degree of lipolysis depends on the wavelength, laser power and energy density. Irradiation can stimulate collagen deposition in the subdermal tissue and in the reticular dermis.[24] Levi et al.,[24] performed a histological evaluation of lipolysis comparing three concentric wave (CW) lasers 980, 1370 and 1470nm and three pulsed lasers 1064, 1320 and 1440nm, concluding that in terms of skin safety, hemostasis and efficacy, the low-power pulsed laser (6-12w) at a high absorption wavelength (e.g., 1440nm) is a good option for treating skin flaccidity, creating controllable deposition of collagen in the subdermal tissue and in the reticular dermis. With low-absorption wavelength lasers, similar collagen deposition could be achieved, but at the expense of the overall appearance of the skin.[24] Lukac M, et al.,[25] reported that absorption attenuates the effects of scattering. As absorption increases, the "free path" of the photons is reduced, limiting the thermal volume. Very weak absorption would result in a large amount of scattering. Its selective photothermolytic effect is mediated by subcutaneous chromophores receptive to specific laser wavelengths, which subsequently dictate the penetration depth and scattering profile, with high-absorption lasers providing localized effects, while low-absorption lasers elicit more diffuse responses.[14,20] Sadoughifar et al.,[26] reported that the 1470 nm diode laser is able to penetrate deep into tissues due to its high affinity for fat and water. The richer a tissue is in water and fat, the better the transmission of this laser and the lower its dispersion. In addition, fat is rich in glycerol, which further facilitates the effectiveness of the laser.

It should be said that the effect of laser action is caused not only by the characteristics of spectral radiation, power, laser exposure, but also by the optal properties of the tissues. Therefore, the choice of operational parameters should be based on each individual case on the results of experimental studies carried out on different biological tissues with several opal and mechanical properties.[9,19,20,27] The opal properties of the subcutaneous layer, the near dermis and the epidermis are not the same, but all depend strongly on the wavelength of the laser.[9,25] In human skin and adipose tissues for wavelengths between 450 nm and 1800 nm, dispersion predominates over direct absorption.[25] Figure 4 30 reduced absorption and dispersion coefficient

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of subcutaneous fat and dermis as a function of the laser wavelength. For both tissues there are two peaks of greater absorption around 1210 and 1450nm.

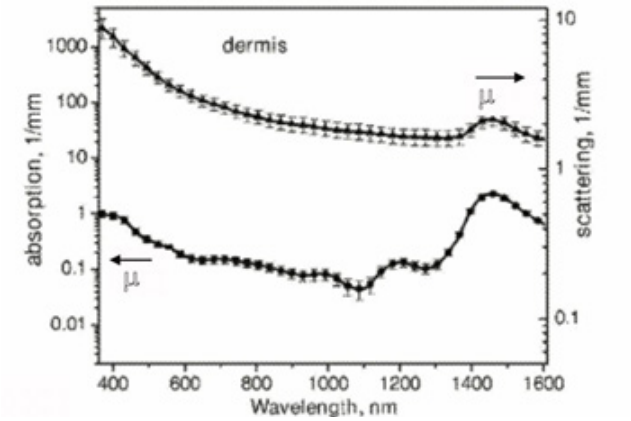

Figure 4 Reduced absorption and scattering coefficient of subcutaneous fat and dermis as a function of laser wavelength. For both tissues there are two peaks of greater absorption around 1210 and 1450nm30.

The interaction of the laser with the tissue is achieved by the absorption of light energy by the chromophores (structures sensitive to a specific wavelength), which produces enough heat to achieve thermal damage.[13,18] Heat acts on fat cells, causing cellular damage and affecting the extracellular matrix. In adipose tissue, adipocytes contain more than 90% lipids, are arranged in clusters and between them there are structures such as water, septa, nerves, vessels, capillaries and elements of connective tissue.[13] The optical window in the dermis and adipose tissue, which is between 400nm and 1500nm, presents, as a physical phenomenon, greater scattering in relation to absorption.[28] The 1470 nm laser emits light energy that is preferentially absorbed by water, but with less penetration and dispersion in tissues compared to shorter wavelength lasers. As a result, it induces a rapid and localized contouring effect, with a lower thermal impact sufficient to induce tissue hardening, with minimal scarring.[9,17] According to Brooke RS, et al.,[29] Lipid or water-selective laser wavelengths with low absorption produce lower peak temperatures and more uniform volume heating, while lipid-selective wavelengths offer greater safety near the dermis because they are less absorbed by the much higher water content of the dermis. The ideal procedure should also increase tissue and skin contraction or tightening while maintaining natural flexibility.

Schumillova NA, et al.,[19] performed an in vitro study with different biological tissues to test the effects of the contact action of 1470nm vs 810nm semiconductor lasers, increasing the radiation power of the 1470 nm wavelength laser contributed to increasing the width of the ablation zone and coagulation to a greater degree compared to the 810 nm laser. Regarding crater depth, 1470 nm radiation is inferior to 810 nm radiation, but is superior in terms of vaporization abilities. For tissue ablation with a 1470 nm laser, a power of 2 W is optimal, since it provides a sparing superficial effect and, in several cases, exceeds the action of the 7 W 810 nm laser in its coagulation properties. The generation of a crater with a shallower depth after application of the 1470 nm laser allows it to be recommended for superficial coagulation of vascular lesions compared to other wavelengths, less energy (Waβ) is required. This results in a greater tightening effect and a necessary lipolytic effect, with a lower thermal risk.[19] This work is important and supports what was cited by Saran et al.,[17] who described for the simultaneous emission of both wavelengths, we must select lower energies for each laser than would be the case when used separately. We agree with this and we draw attention to the care and correct summation of energies in order to avoid any structural damage.

Sigova et al., described that 980nm diode laser devices have water (intra and extracellular) as a chromophore, but this wavelength also has a recognized application in adjuvant treatment in liposuction, since over time it was discovered that there is an absorption curve for human fat that would behave differently from the laser action band in water. Thus, presenting better absorption by fat than by water, which provides lipolysis without the need for high energy.[13,14] Thus, this wavelength has proven to be an excellent method for uniform fat solubilization (laser lipolysis, altering the permeability of the adipocyte membrane.[14]

Endolifting® meets the demand for innovative and less invasive aesthetic procedures, as it is a procedure that does not require incisions and sutures, with fast recovery time and natural, long-lasting results.[3] Several clinical studies validate the Endolifting® technique, using a laser beam with a wavelength of 1470 nm, as published in the pilot study carried out by Dias et al.,[15] which investigated the effectiveness of the 1470 nm diode laser in reducing double chin using the Endolifting® technique, demonstrating remarkable results.[15] In agreement with Nilforoushzadeh MA, et al.,[7] who conducted a study with 9 patients suggesting the Endolifit laser as a new procedure to reduce double chin fat in these patients. The results of the treatment were measured by biometric evaluation. The treatment was significantly effective, without side effects and pain and well tolerated by the patients. This study demonstrates that the Endolift laser is a safe and effective non-surgical method for double chin reduction, highlighting the feasibility, convenience and safety of the technique. The results showed that the Endolift laser can increase the thickness, density and elasticity of the skin in the double chin area.[7]

The use of endolaser for body aesthetic disorders is efficient and has promising results. The main body conditions treated are localized fat in the inner region of the arms, abdomen, inner thighs, knees, ankles.[2,4,7,13,14,30,31,32] Nilforoushzadeh MA, et al.,[7] presented a study with ten patients with excess fat in the arms and abdomen treated with Endolift laser. The results showed reduction in fat and circumference of the arms and abdomen after treatment. The treatment was considered as effective methods with high patient satisfaction. Endolift laser can be a good alternative to surgical contouring of body fat due to its effectiveness, safety, minimal recovery time and low cost. In addition, Endolift laser does not require general anesthesia.

Important scientific studies, which relate some wavelengths, such as 980 nm, with great affinity/absorption by water contained within adipocytes, demonstrate the effectiveness and safety of laser in liposuction.[13] Marysabel Q & Suárez O,[10] who used Endolifting® with 980nm diode in 8 patients and in all cases a clear improvement in the cervicomental angle was observed, as well as a reduction in the double chin, nasolabial fold, submental adiposity and an improvement in the texture and quality of the skin and satisfaction of the results. Trelles et al.,[33] in their work in which they performed lipolysis with 980nm diode endolaser in 32 patients with gynecomas and observed excellent skin and areolar retraction in 26 cases and good breast and areolar retraction in 5 cases. Centurión et al.,[34] in which he applied the endolaser technique in 240 patients with 980nm diode as a complement to liposuction, in the same way as Dornelles et al.,[13] reported such experience with 400 cases; both studies There was significant skin retraction in all patients, as well as a reduction in the recovery period and a decrease in bruising compared to the conventional technique.

This shows that the endolaser used in any area of the body will cause the necessary skin retraction and body remodeling through lipolysis so that the aesthetic results are the most appropriate.

Most recently, Mendes & Moleiro[3] carried out a clinical study on 10 patients undergoing endolaser procedures to treat localized fat and abdominal sagging, of which 5 patients received treatment with a wavelength of 980nn and 5 patients received treatment with a wavelength of 1470nn. Both wavelengths, 980 nn and 1470 nn, were shown to be effective in improving the aesthetics and satisfaction of patients. And Saran et al.,[17] presented a study with three clinical cases of different age groups: 40+, 50+ and 60+ using the combination of both wavelengths, one more specific for lipolysis (980nm) and the other (1,470nm) being more appropriate to induce tissular retraction and toning, it was possible to deliver results that corresponded to the patients' expectations, improving the color, texture, toning and tissular repositioning of the face and neck region.

In this context, aiming for increasingly promising results, with the need for fewer sessions and greater comfort and well-being for patients, following the constant advances in clinical studies that have already validated the effectiveness of the 1470 nm wavelength diode laser in combination with the Endolifting® technique for the reduction of facial fat. However, we understand this work of the Endolifting® technique as unprecedented with dual wavelength 980nm and 1470nm covering both facial and body fat reduction. Based on the studies previously presented, we justify the use of dual wave associated with the Endolifting® technique for cases of fat accumulation on both the face and body, as we have seen, shorter wavelength lasers suffer less absorption and greater dispersion of thermal energy. Another important point to highlight is that we agree with the work presented by For example, a pilot study conducted by Dias et al.,[12] investigated the effectiveness of the 1470 nm diode laser in reducing double chin using the Endolifting® technique, demonstrating remarkable results. Furthermore, the study by Longo et al.,[5] by Nilforoushzadeh MA et al.,[7] and more recently by Rodrigues et al.,[9] corroborate these findings by observing positive results in the reduction of fat and sagging skin in the lower third of the face. The application of the laser in the liposuction procedure promotes a decrease in mechanical trauma to the surrounding tissues, which translates into less stimulation of the formation of fibrosis, with reduced bleeding due to the coagulation of blood vessels, favoring postoperative comfort, with less pain and faster recovery. In addition, there is marked tissue retraction, both immediate and delayed, due to the stimulation of collagen, which is better evaluated after the third month postoperatively.[12,13]

It is crucial to highlight that the approach with dual wave diode laser with dual wavelength 980 and 1470 nm in the Endolifting® technique It is a safe, replicable technique that meets the expectations of patients seeking to reduce non-aesthetic fat while also seeking tissue retraction and less invasive, lower-risk aesthetic procedures.[35–40]

Conclusion

It was concluded that the Endolifting® technique using the diode laser approach with double wavelength 1470 nm and 980nm for areas of greater fat accumulation is a promising and less invasive non-surgical alternative, extremely effective, safe and replicable and brings better assertiveness by promoting the reduction of non-aesthetic fat. The results observed in the patients of this report reinforce the consistency of previous research that also indicated the success of this approach for both facial and body regions and is in line with the continuous evolution of aesthetic dermatology, where technological innovation aims to meet patients' expectations for better aesthetic appearance and well-being and quality of life combined with effective results, with reduced risks and recovery time.

This work makes room for future studies that further explore long-term results, effectiveness in different clinical conditions and the optimization of endolaser application techniques. Finally, the authors hope that this work will contribute to the continuous and essential technological advancement in the aesthetic area and to the improvement of therapeutic options, meeting current needs and always aiming at the well-being of patients.

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Conflict of interest

The authors declared that there are no conflicts of interest.

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