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Efficacy Of 1470 Nm Laser In Non-Surgical Double Chin Removal And Facial Contouring: A Comparison Between Radial And Linear Optic Fibers

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Abstract

Background: Localized fat pertaining to the face especially beneath the chin, leads to the accruement of aged faces in the shape of roundness of cheeks, jowling and appearing of a double chin. Age-related alterations in subcutaneous white adipose tissue, decrease in skin elasticity, modification of the collagen and diminished dermal-fat adhesion influence these changes. The diode laser (1470 nm) has come as a non-surgical, minimally invasive way of reducing facial fat and skin tightening.

Aim: This study aimed to assess the effectiveness and safety of the 1470 nm laser according to linear optic fibers in the non-surgical elimination of the fat in the chin and in contouring the face and compare it to the radial one, which facilitates effective fat reduction and skin tightening in the submental and mandibular areas.

Methodology: Ten female patients with mild-moderate submental adiposity were subjected to a single treatment session of laser- assisted lipolysis under local tumescent anesthesia to treat submental adiposity using the 1470 nmdiode laser with linear optic fibers. Measures were evaluated with the baseline, 1, 3, and 6 months ultrasound imaging, adipometry, standardized photography, and patient satisfaction surveys. The safety and tolerability were also observed.

Results: The linear fiber method proved to show a significant decrease of the submental fat combined with the clearer outline of the chin and jawline, as well as an increase in skin tone and elasticity. Natural, gradual improvements of aesthetics and a minimal downtime were highly satisfying to patients. Means of skin texture and thickness maintained thinning of fat and an improved skin texture. The effect was minimal and undesirable effects of the procedure proved to be minimal due to the capability of the 1470 nm wavelength to specifically target water and fat tissues in the body by virtue of its high absorption. Linear fibers also allowed more focused energy delivery in the cutaneous fat planes compared to radial fibers, improving precision and efficacy of treatment, especially in sensitive region of the face.

Conclusion: The non-surgical technique of the 1470 nm diode laser with the linear optic fibers is safe and highly effective in reducing the amount of fat in the chin and achieving the shape of the face, causing disruption in the adipose tissue and removing the collagen. It gives optimal clinical and cosmetic results due to its optimal directional energy deposit; has minimal side effects, and recovery time as compared to radial fibers. The modality is a major breakthrough in minimally invasive facial rejuvenation that deals with fat reduction as well as skin laxity necessary in lower-face definition enhancement.

Keywords: 1470 Nm Laser, Double Chin Removal, Facial Contouring, Radial Optic Fibers, Linear Optic Fibers

Introduction

During recent years the number of people who are worried about excesses of fat that are gathered in some particular area of the face have increased and this may be more seen when persons become age. As individuals grow old enough, shifting of facial geometrical shape and subcutaneous fat deposition leads to appearance of the common aging characteristics including rounded cheeks, jowling and attainment of a double chin. Such anatomical changes are complicated with the aspect of genetic predisposition, decrease in skin elasticity, and decline in muscle tone (**Arora & Shirolikar, 2023; Wollina et al., 2017**). It has been observed in scientific literature (Wollina et al., 2017) that an increase or decrease in the volume of the subcutaneous white adipose tissue, changes in the level of collagen, attenuated contact between the dermis and the adipose tissue, are serious causes that result in the onset of wrinkles and the formation of a more aged image of the face (**Wollina et al., 2017**).

Different types of treatment modalities have therefore been invented to cure these esthetic issues and one such promising method is the use of lasers in the reduction of fat in the face. In comparison with conventional surgical technologies, laser-based surgery is a less invasive way to provoke localized fat distribution. When talking about the facial rejuvenation process, the lasers are used to heat and focus on a specific area and break the fat cells, which in turn are slowly dissolved through the natural processes occurring in the human body. Not only does this controlled thermal injury break down the unwanted fat, especially in the areas of the face that are difficult to treat, such as the lower face and submental area, but also triggers collagen remodeling and over long-term period provides skin tightening as well as contour improvement (**Arora & Shirolikar, 2023**).

The 1470 nm laser usage has become a new, less invasive method of attacking Submental (under chin) adiposity and developing facial contouring nonsurgically. Such wavelength is effective due to its high absorption by water in the adipose tissue resulting in regulated thermal effects, which selectively breaks fat cells with subsequent effect of creating tightening on the skin and underlying collagen fibers. These two processes, namely lipolysis and skin shrinking, treat both redundant fat and skin laxity, which are essential factors in correction of a more defined jawline and a reduction of the appearance of a double chin (**Heller et al., 2022**).

The 1470 nm radial fiber technology has the advantages of being able to produce rapid and local effects when compared to traditional surgery or even earlier laser-assisted lipolysis systems with little downtimes and minimal scarring. It is also common

service to patients who report considerable gains on contour and skin tightness as well since the modality offers fat removal as well as skin surface renewal options. The successfulness of such a non-surgical procedure is served by its low risk character against potential replacements requiring surgery, low post-warrant complication, and increased patient fulfillment ascribed to fast recuperation duration and incapability to leave an evident scar (**Dias et al., 2023**).

The 1470 nm laser has been found extremely successful in facial and body contouring upon clinical trials. Case in point, a study based on its use in body sculpting and facial fat grafting produced localized area enhancement in contour as well as enhancement of overall skin, with significant ablation of underlying fat and noticeable contour development. The versatility of the technique in aesthetic medicine is also stipulated by the fact that patients can use the captured fat as a filler of their faces or their bodies in the near future (**Heller et al., 2022**). Even in other prospective studies with non-ablative laser therapy in the face using 1470 nm, they found that skin texture, elasticity and depth and diameter of surface irregularities have been significantly improved and confirmed the efficacy of wavelength in face rejuvenation and contouring. According to these studies, significant therapeutic effect and safety profile were found with high satisfaction rates of the patients with not only reduction of fat on the face but also an increase of overall harmony of the face (**Kubik et al., 2025**).

The unique feature of 1470 nm laser is that it can be used on those patients that do not want to have surgical intervention or whose health state does not imply being a good candidate in terms of surgery. The low profile of the procedure adds to its salability factor as minimal downtime and a predictable and controllable tissue response are repeating requirements of any patient seeking the natural look with minimal recovery. Moreover, the thermal impact of the dermis would contribute to the remodeling of collagen and skin tightening, which would provide patients with an additional benefit when compared to the mere decrease of fat: an absolute advantage of this modality of treating patients with non-surgical fat-reduction modalities, which otherwise do not focus on skin laxity (**Heller et al., 2022; Kubik et al., 2025**).

To the effort of laser performance of 1470 nm laser in terms of non-surgical removal of the double chin and non-surgical facial contouring, the selection of radial and linear (bare-tip) optic fibers plays a vital role, especially in the safety concern and level of tissue engagement. In both types of fibers, laser-assisted liposuction is performed by employing the high-absorption at the 1470 nm wavelength by water to target the adipose tissue in accentuating fat elimination and tightening the skin **(Heller et al., 2022).** This paper was meant to get initial findings regarding the actual efficiency of the 1470 nm diode laser particularly linear optic fibers in the removal of facial fat in non-surgical procedures of removing of a double chin and shaping of the face when compared to Radial Optic Fibers.

Literature Review

A holistic medical apparatus that was created adhering to the high demands of thoroughness in design is the LaserMe 1470 nm which was synthesized by Berger&Kraft Medical Sp. z o.o. in Poland. This device is especially designed to work in the field of dermatology, aesthetic medicine, general, and plastic surgery, and cosmetology and helps to give the monochromatic light right to the skin in order to create a range of therapeutic processes. Its varied uses are skin rejuvenation, skin tightening, and drug delivery to the skin, improvement of enlarged pores, all-skin disorders like scarring including acne scars and stretch marks. The instrument functions to deliver radiation in pulsed multi-millisecond over an equally constant power output. The operator selects essential parameters, energy density per pulse (adjustable between 5-50 mJ/point), pulse duration and repetition frequency. It is important to note that the LaserMe is a fractional, non-ablative laser of the 1470nm wavelength diode with the maximum power of 2W that can be used to achieve a fractional non-ablative skin resurfacing (Kubik et al., 2025).

The radial fibers are built to disperse laser energy in a 360-degree angle, thereby enabling the more even/circumferential deposition of heat within the point of convergence of the laser into the tissue. Such wide diffusion and homogeneous energy transfer is especially beneficial in operations where it is essential to eliminate as many side effects as possible, such as bruising and pain. Initial reports that have compared the use of radial fibers with bare-tip (linear) fibers during endovenous laser ablation (EVLA) using a 1470 nm laser have shown that using radial fibers resulted in much lower levels of bruising and pain compared to bare-tip fibers **(Hirokawa & Kurihara, 2014).** The softer thermal effect is believed to be due to the radial emission pattern, that minimizes localised overheating and trauma around the target area. This means fewer side effects, softer and safer treatment in the case of non-surgical removal of the double chin and facial contouring with less discomfort after the procedure and faster recovering periods. The conformal energy delivery also leads to a more stable contouring and tightening effect, since the laser energy is evenly and efficiently consumed with the water in the adipose tissue, and this leads to lipolysis and collagen modeling throughout the treated region. Moreover, the obtained fat might also be used as autologous filling material in other cosmetic surgeries, and it is rather evident why this method is so flexible (**Heller et al., 2022).**

Linear or bare-tip fibers on the other hand generate laser in a forward f dire, focussed beam. Although this is fine in terms of delivering energy to a precise point this also can cause increased localized heat and possibly increased collateral tissue damage unless scrupulously controlled. Conventionally, research has revealed that bare-tip fibers, unlike radial fibers, have shown similar rates in long-term occlusion but a greater risk of pain and bruising afterwards in view of endovenous laser ablation conditions (**Hirokawa & Kurihara, 2014**). It is because of the focused linear release of energy that may result into hot spots and a less uniform thermal consequence in contrast to the radial emission. In very sensitive regions such as the face and submental areas, where the reduction of discomfort and side effects is most important, the inferior uniformity of the energy deposition of the linear fibers may require that care be used in its application. Nevertheless, their specific energy release might be more useful in very specific, localized fat tissue, in case the clinician has a higher level of control and the knowledge of tissue response to avoid the over-treatment. Linear fibers efficacy were also related to the different applied linear endovenous energy density (LEED) where higher ones achieved improved long-term vein occlusion rates in treatment with no importance increasing its side effects implying a dose-response relationship between desired outcomes **(Essam et al., 2013).**

Literatures have suggested that the radial fiber has a more diffuse distribution of the laser energy over the tip of the fiber, which is beneficial to a localized heating by contact with minimal tissue damage that is optimal in contouring. A single study has noted that the 1470-nm radial fiber-assisted liposuction has a broad feature of quick and local contouring and tightening capacity, thus it can be applied in fat reduction and fat graft harvesting in the face and body. Nonetheless, the energy distribution of the radial fiber, although advantageous, might transfer the heat into the nearby tissue, which will reduce the precision of small facial areas (**Heller et al., 2022**).

Conversely, the studies performed with the linear optic fiber have yielded better results both in targeting the fibrous septa and fat compartments directly, thus increasing the accuracy of adipose tissue destruction and skin tightening necessary to alter the appearance of the submental area and the definition of a jawline. Linear fibers release laser energy in a focus manner, and this energy is controllable to direct desirable interaction into a photothermal direction, accurately defined along the intended fat layers and fibrous orientation. This has the effects of making the disruption of fat more consistent and collagen remodeling, even more, which produces better clinical results in reduction of a double chin and in overall facial contouring (**Choi & Yi, 2023**).

Furthermore, these comparative studies highlight fact that linear fibers offer greater degree of control of laser delivery and are less likely to cause unwanted collateral thermal injuries and are safer and more comfortable to a patient. The increased flexibility in shaping the fats pads along straight trajectories fits the anatomical arrangement of the submental fat compartments that will produce more predictable outcomes of contouring and prolonged skin tightening, contrasting with a radial pattern of energy distribution that is less directional (**Li et al., 2022**).

Materials and Methods

1) Patients Selection

This study on the effectiveness of the 1470 nm laser in non-surgical removal of the submental area and contouring of the face was done on women aged beyond 18 years who had reported concerns on sub-mental fat and lack of facial contouring. The inclusion criteria included persons who had mild to moderate levels of adipose tissue gathered and/or skin loose mostly on the mandibular and submental areas, and who could benefit lasers to reduce fat and tightening of the skin. Inclusion was preceded by a written and verbal informed consent of all participants.

Strict adherence to the use of exclusion criteria was made to make sure patient safety and confounding factors were eliminated. Patients who presented signs of hypersensitivity to local anesthetics like lidocaine were also excluded since they were bound to contribute to unpleasant experiences during the process. Those who were pregnant or breastfeeding were not included as it might cause some unknown risk. Excluded were also those with un-managed systematic illnesses, including decompensated cardiovascular, immunologic conditions, or diabetes because of the hindrance in healing a wound and increased risk of complication development. In addition, the patients who have had a history of malignancy or presence of foreign synthetic materials (e.g., metallic implants or permanent fillers) in the area of treatment, were excluded as such conditions may affect laser-tissue responses or outcomes in safety issues.

To conduct a comparative analysis of radial and linear optic fibers, the selection of patients was carried out to make the population homogeneous in the group according to the age, body mass index, the level of submental fat, and skin elasticity. This sampling was done as a way to isolate the outcome that fiber type had on outcomes. Besides, patients who ever received surgical or laser procedure in the submental area within six months were excluded because this could interfere with responses to treatment.

This approach of selecting patients represented the best patient population to rely on to prove the high level of accuracy and effectiveness of the linear optic fiber in transmitting 1470 nm laser energy to focus it on specific areas of the face to reduce and lighten fat and improve the overall shape of the face, with the highest level of safety and tolerance to the procedures.

2) Study Design

Laser-assisted lipolysis was done under local tumescent anesthesia. Treatment procedure was an insertion of a thin cannula with linear optical fiber into the subcutaneous fatty tissue of the submental region as well as along the line of the mandibular border by the means of a small puncture hole. The linear fiber conveyed laser energy in a directional manner along the desired fat compartments and fibrous septa, and the linear movement was controlled by a fair distribution of disrupting adipose tissue and effecting to collagen remodeling. The clinician conducted continuous palpation over the treatment zone to observe the effects on the tissue and avoid any overheating. The energy parameters were of course determined on a patient-by-patient basis but generally implied careful titration of photothermal energy deposition to provide satisfactory lipolysis without the production of thermal injury. There was a session time of about 30-45 minutes.

Follow-up steps involved the use of cool compress to reduce inflammation and pain. The clinical endpoint of fat reduction, skin tightening, and an overall facial contour was assessed at 1, 3, and 6 months after the treatment using standard photography and objective measures of a fat reduction and skin tightening.

3) Treatment

All patients received an initial assessment prior to treatment using the following techniques: standardized photographic images by frontal, 45 o oblique, and profile views were taken using a Sony A73 camera with a 50mm f/1.8 lens to make sure that the faces had consistent documentation of contours and submental fullness. Subcutaneous fat thickness and skin quality were assessed by Ultrasonographic assessment (linear ultrasound probe B23A, Onetech). To objectively measure adipometry, the layer thickness objectively was measured using an Innovare4 device (Cescorf). Also, patient satisfaction and expectations were

assessed using a survey based on the Likert Scale with 1-6 to build up baseline subjective data where 1 compiles the factor of complete dissatisfaction to 5 deals with complete satisfaction.
One tablet of analgesia premedication was used 30 minutes before the procedure in the patients. The region of the treatment, e.g., the submental and mandibular areas were thoroughly cleaned using 70 percent of isopropyl alcohol as a means of asepsis. Accurate areas of treatment on the skin were then identified by drawing lines on the skin with a marker that is safe to the skin. In contrast to the customary fan-shaped vector diagram of the radial fibers, the vectors marked out on the linear fiber were longitudinally placed in the range of 1-2 cm far apart corresponding to the natural anatomical directions of the submental fat compartments and fibrous septa and the alignment of the laser directional delivery was maximized.

Figure 1: Highlight of the necessary vectors for signaling the direction of the linear optical fiber movements.

A 30-gauge needle was used to inject Xylestesin with 2m2 vasoconstrictor at each intended insertion site of the fibers to have adequate local anesthesia and reduce bleeding by using an anesthetic button. After applying anesthesia, tiny puncture sites were created at these points in order to inject the linear optic fiber which was located inside a thin cannula gently into it.
The linear fiber was then pushed into the subcutaneous fat area and laser was administered in a clear linear movement with the linear withdrawal of the fiber following the vectors. It allowed an accurate and homogeneous photothermal destruction of affected fat compartments and stimulation of collagen to tighten skin. A constant maintenance with palpation was maintained as well to determine how the tissue may react and to ensure safety. The parameters used in the procedure such as the power settings and time were customized as per the anatomy of the patients yet standardized protocols were also used as per 1470 nm wavelengths.

Figure 2: Practical procedure in the submental region where the guide laser beam can be seen (wavelength in the red spectral range) indicating the location of the optical fiber end.

Once the orifice was applied, a 22G/50mm cannula was then used to push gently into the opening creating an opening through which local anesthetic could be introduced. About 0.1 ml of Xylestesin containing 2 per cent vasoconstrictor was applied to each of the marked line vectors to make sure that the target fat bodies were fully anesthetized. When the whole place of treatment was fully sufficient with anesthesia and the laser was off the linear optic fiber would be inserted through the cannula and slowly manipulated to the terminal part of each drawn line of vectors on the skin.

After proper positioning, the laser at 1470 nm wavelength was switched on and the linear fiber was then pulled out of the body gradually and without any pulsation along the vector to the subdermal fat and fibrous septa providing directional laser energy onto the subdermal fat and fibrous septa. This back and forth motion was done three to six times per vector with the goal of getting uniform irradiation and success of disrupting adipose tissue via photothermal techniques and collagen remodeling of the overlying skin (see Figure 2). To account the tissue response, continuous monitoring using manual palpation was conducted at the given procedure to prevent focal overheating.

This was followed by the administration of laser on the entire area of skin to be treated and a massaging action that would help in clearing the emulsified fatty tissue through the orifice created. The area of treatment was cleaned with antiseptic solution and a protective bandage with 50 mm Micropore tape (3M) was put on the points of entry.

Follow-up visits were done on a total of 4 months where two re-testing will be done on each patient at the two month and four months mark after the treatment. The same standardized imaging (photographic, ultrasound, adipometry) applied at baseline was repeated at each follow-up in order to objectively assess the effect of any given treatment. Moreover, the subjective results of treatment were taken on the basis of the Likert Scale that the patients completed the satisfaction survey. This protocol adapted to the linear optic fiber maximised the directional and controlled delivery of energy that is specific to this type of optic fiber hence worked towards maximising non-surgical fat reduction under the chin and of the face with limited downtime and maximum safety.

Results and Discussion

This study reported findings of 10 patients based on their first procedure. Already at the end of the cycle of non-invasive treatment with the 1470 nm diode laser applied through Linear Optic Fibers, the patient showed significant decrease of submental adiposity prompting markedly thinner and more defined profile of the chin. This is in accordance with prior studies conducted by (**Dias et al., 2023**) on the use of endolifting method to reduce facial fat and toning the skin that demonstrated that application of 1470 nm diode laser with Linear Optic Fibers is effective in reducing submental adiposity and improvement of lower facial contours and the patients provided high satisfaction rate because the visual changes that resulted in this process are natural and gradual and there is no significant downtime due to the non-surgical nature of procedure. The clinical assessment parameter based on our findings indicated marked augmentation of the contour of the lower face and apt application to focus on the subcutaneous fatty layer of our face without injuring other tissues present. A work on (**Li et al., 2019**) proposed another minimally-invasive-type laser and have considered the impact of the 1470nm diode laser within intralesional fiber on inflamed keloids. The linear (bare optical fiber) could be applied to deliver some of the natural limitations presented when employed to transfer energy, with the help of infrared laser. Water and hemoglobin (or more specifically deoxyhemoglobin) absorb the 1470nm, and the depth of penetration is about 23mm. The diode laser and fiber system at 1470 nm hence produces hot-spot heating in a small area. The moisture content of the surrounding tissue is fast vaporized and the cells experience lysis, necrosis and solidification making the tissue to be ablated. Also, the 1470 nm laser serves to coagulate blood vessels, decrease blood supply and local vascularization of tissues.

In our study the procedure proved to be well-accepted and our patients suffered no complications (burns or prolonged swelling) as the heat control was attained with ease representing precision of the 1470 nm wave with the ability to state that it is preferentially absorbed by water and fat tissues of the body. Study of **(Friedmann et al., 2024)** of endovenous laser ablation states that absorption of 1470 nm wavelength laser occurs mostly by water in the tissue leading to very well directed thermal effect. This wavelength prevents excessive spreading of photons outside the targeted region hence little heat is loaded to the inner layer of the vein and this preserves tissue damage and relation to vein ulceration or perforation and therefore the limited tissue damage. Photothermal effects (on heating) in this wavelength contribute to heat energy at the vessel wall with less than 20 percent, thus avoiding excessive thermal damage.

This is because the exact nature of the heat generation that is the property of the 1470 nm wavelength is related to the interaction between the wavelength with water and fat because these are the two key chromophores who take up the laser energy efficiently. This absorption leads to the laser providing controlled energy, which reduces the chances of burning or the extensive swelling and patient comfort during and after the treatment. Also, optical fibers that are of linear delivery can be very important since it helps to achieve an equal distribution of energy along tissue. This is due to the optimal delivery system which increases the safety profile by avoiding hotspots which would otherwise lead to feelings of discomfort or interactions of an adverse nature **(Friedmann et al., 2024)**.

In our findings, the mild heat effect facilitated the remodeling of the collagen and tightening of the skin resulting in improvement in the firmness and elasticity of the skin in the treated site which in turn increased the improved contours of the face and even possible to observe reduction of flaccidity and lines. As literature supports, the fine thermal effect of 1470 nm laser as applied through linear optical fiber is effective in stimulating the remodeling of collagen and firming up of skin due to its ability to tighten the skin, which improves firmness, elasticity and facial contours with outstanding reductions in flaccidity and wrinkles. The study done in 2024 on the Endoskin nonsurgical method that involves the use of the 1470 nm diode and the poly-L-lactic acid (PLLA) suggests that the laser specifically targets the topmost fat layer and spurs on collagen and the rejuvenation of cells. As a result of this procedure, the skin becomes evenly tightened and gains elasticity, strengthening the base of the skin and adding back volume and overall lips and face contours (**Benar & Benar, 2024**). A pilot study of an endolifting second-generation technology with the 1470 nm laser applied on the subdermal tissue of the face showed a definite

result in reduction of facial fat and a potent skin retraction, volume reduction and decrease in wrinkles after 60 days after the treatment. The authors of the study explained the effects as produced by intensive production of collagen, caused by a laser and favorable to sustaining skin tone and facial rejuvenation **(Dias et al., 2023).**
Additional support is provided by systematic reviews of intralesional 1470nm diode laser treatments in dermatological aesthetics which state that it has a high safety record and is effective in treating collagen remodeling and tightening of the skin **(Nilforoushzadeh et al., 2024).** Water and fat in the subdermal layer specifically absorb the heat in the mid-infrared wavelength of the laser and there is a controlled heating that leads to activation of fibroblast without causing any damage to the epidermis, thereby triggering the production and remodeling of collagen in the dermis that helps in improving both the firmness and elasticity. Linear optical fibers provide a smooth delivery of the heating effect to the skin, taking place gradually to allow the dermal remodeling process and minor side effects (**Benar & Benar, 2024**; **Dias et al., 2023)**.
The adherents expressed their great satisfaction at follow-up visits after several weeks following treatment, at both the aesthetic effects, which are natural and progressive, and at the fact that the modality also involves no recovery period whatsoever. Such objective measures as photos and ultrasound revealed prolonged fat thickness decrease and enhancement of skin density.
Such favourable results align with established benefits of 1470 nm lasers, which provide efficacy at the application of reducing adipose tissue and reduced exposure to high-grade thermal effects, resulting in safe, effective and sustainable outcomes when used in facial contouring procedures. Linear Optic Fibers were used to ensure that energy was delivered where it was needed in exact proportions to enhance optimal uniformity and effect of therapy in reduction of double chins.
The study on previous literatures such as **(Upadhyaya , 2014; Yu et al., 2018)** confirms the application of linear optic fibers in the delivery of precise energy form which increases the uniformity and efficacy of treatment including dermatological and cosmetic procedures including reducing chins. In particular, one of the traits of the fiber optic technology is acknowledged to be its laser energy guiding and directing capacities, which benefit therapeutic effects by maximizing them through the optimistic measure of high precision. Through the use of linear optic fibers, fiber lasers provide controlled continuous-wave or pulsed laser power, permitting high accuracies in targeting tissues selectively with limited collateral damage. Such precise delivery is relevant to the consistent energy dispersion without which the treatment is not effective and safe to patients.

Optimal delivery is possible with linear optic fibers because a quality beam can be maintained with minimal loss which results in a consistent application of the energy over the treatment zone. This feature enhances the uniformity of treatment and the maximal effectiveness which is important in the precarious treatments like the reduction of adipose tissue under the chin. The high power laser and a fibre optic work on fibre optics indicates fibre optic laser performance and control over energy transmission is improved, drawing on the success of double-clad fibers, which allow extremely fine control over the rate of energy transfer through the fibre and the location of approximately placed energy emission from a fibre-optic laser.

Figure 3: Result showing smoothing of the nasolabial folds and cheeks as well as the drooping of the mouth corner, improvement in facial and mandibular contouring, and a significant reduction in the double chin.

Figure 4: Result showing smoothing of the nasolabial folds, cheeks, mouth corner, improvement in facial contouring and mandibular contouring, and significant reduction in the double chin.

It was observed after the analysis of the photos of the patients in figure 3 and 4 that there was obviously a loss of submental fullness following the treatment and the jawline and chin appeared more defined and contourated. The success of the treatment is indicated in the images shown in the post-treatment images due to the smoother skin profile with tighter skin underneath the chin. This is because the laser makes use of lucrative steps in attaining a firmer skin which is the ability to react to fat present under the skin otherwise known as subcutaneous fat and also through the stimulation of collagen remodeling. Along with it, the natural-looking effect of the contour suggests gradual and subtle results of the procedure with minimal overcorrection and regularity of the skin. There are no indications of surface destruction and excessive swelling, so it is likely to be a non-invasive intervention that is well tolerated by the patient, but with little postoperative recovery. In general, the photos demonstrate good visual evidence, which proves the effectiveness of 1470lm laser treatment with Linear Optic Fibers in terms of decreasing the volume of the double chin and enhancing the contours of the lower face in the safe, controlled, and patient-friendly fashion.

Although other researchers have pointed out the multi-usability of 1470 nm diode lasers in other medical practices including hemorrhoidal laser ablation, fecal incontinence and benign prostatic hyperplasia **(Kavraal et al., 2024; Xiao et al., 2023; Huang et al., 2023)**, the current research was specific about its use in facial contouring. The exact energy delivery made by Linear Optic Fibers optimized the uniformity of treatment, which is beneficial in the attainment of desired effects within the reduction of a double chin. The results of this study also find support in the visual evidence provided in Figure 3 and 4, which depicts an evident decrease in the submental fullness, an increase in the definition of the jawline and the chin, as well as a more smooth and tight skin profile, post treatment. These findings reiterate the efficacy and safety of the therapy with 1470 nm Laser in lower facial contours enhancement through Linear Optic Fibers.

With regard to non-surgical treatment of a double chin and face contouring, the selection of linear or radial optic fiber used to deliver 1470 nm laser beam has a strong impact on the treatment outcome. The 1470 radial fiber energy spreads out laser energy all around the periphery of the fiber tip enhancing a wider and horizontal heat distribution. This property renders the radial fibers higher advantage in laser-assisted liposuction, body contouring and densely localized tightening, and rapid contouring with little or no scar tissue, as they effectively reach water in tissue. But this lateral broadness of the energy field might cause less precision while focusing specifically on certain aircraft or tissue such depths, especially making delicate facial areas **(Heller et al., 2022).**

Conversely, the linear fiber brings forth laser energy on a straight pathway and not radially hence it delivers more focused and controlled energy along a given path. This is an ideal linear delivery to specifically target subcutaneous fat deposits / fibrous septa causing tethering of adipose as in the case of Facial Contouring / treatment of the Double chin. The energy delivered linearly therefore amplifies photo-thermal effects at the exact point and with minimal diffusion which ensure that there is less likelihood of undesirable thermal damages of the nearby structures like the nerves and blood vessel **(Heller et al., 2022).**

When it comes to the sensitive regions such as face and neck where anatomy is delicate and the desired result is to tighten and remove fatty areas through a very fine yet effective tightening result, the presentations convey that the safety and predictability of objectives is enhanced when delivering these cases with linear fiber technology, in comparison to radial fibers. It enables the operators of the devices to shape the facial contours in a precise manner enhancing skin tightening and fat reduction without extensive scarring and recovery time that invasive procedures require **(Hirokawa & Kurihara, 2014)**.
Furthermore, 1470 nm has the unique capability of penetrating below the surface to reach the level of the water molecule in the dermis and subcutaneous area in order to actively encourage the reformation of the collagen and the process of lipolysis. Given that this wavelength is delivered through a linear fiber, it focuses its energy in the linear direction of the fiber, and offers the maximum efficacy in fat reduction and tissue contraction required during the treatment of the double chin and minimal collateral damage **(Choi & Yi, 2023).**
Our findings supported the fact that although 1470 nm radial fiber is perfect in even circumferential treatment that is ideal to large or more general areas, the linear fiber works better in non-surgical removal of double chin and contouring the face because of its precise, focused delivery of energy. This enables less risky and more effective fat removal and skin tightening even in the sensitive facial area, attaining better cosmesis results at less side effects and downtime.

Conclusion

The 1470 nm laser has a record of success in non-surgical removal of double chin and facial contouring with a predictable fat reduction and facial contouring and tightening of the overlying skin. It is considered a safe, efficient, and low-recovery procedure, which increases its popularity in aesthetic practice, making it remarkable progress in the sphere of non-invasive facial rejuvenation techniques.
Although the radial and linear fibers and the 1470 nm laser show the strong lipolytic and tightening impacts, the linear optic fiber can be thought of as better in removing atypical chin and shaping the face because its application is more targeted and directional. Such accuracy is reflected in effectiveness, safety, and aesthetic improvements, which make the linear fiber the most wanted mode in clinical practice when it comes to minimally invasive facial contouring procedures.

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