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Efficacy and mechanisms of EndoliftX® in submental skin contraction

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ABSTRACT

This article evaluates the clinical efficacy, safety, and mechanistic insights of using the EndoliftX® laser device (Eufoton®, Trieste, Italy) with interstitial radial fibre delivery technology (ELX fibres, Eufoton®) for submental skin contraction. Through a detailed review of clinical and pre-clinical studies, we explore outcomes, including subcutaneous fat reduction, skin tightening, and collagen remodelling. The analysis includes procedural best practices, potential adverse effects, and patient satisfaction metrics, offering a comprehensive understanding of this minimally invasive procedure as an alternative to surgical neck lifting.

Key words: interstitial laser therapy; skin laxity; submental skin contraction; collagen remodelling; 1470 nm laser.

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Introduction

The field of aesthetic dermatology is witnessing a surge in demand for minimally invasive procedures that deliver substantial results without the downtime or risks associated with surgical interventions. Submental skin tightening,[1] in particular, represents a high-demand area as individuals increasingly seek non-surgical solutions for neck contouring[2] and rejuvenation. Traditional approaches like liposuction or surgical neck lifts are effective but often accompanied by longer recovery times, increased costs, and a higher risk of complications. Consequently, laser-assisted techniques,[3] notably those utilising an interstitial laser technology (EndoliftX® and ELX fibres, Eufoton®, Trieste, Italy),[4] have emerged as promising alternatives due to their precision, safety profile, and efficacy in reducing submental fat and enhancing skin firmness.

The EndoliftX® laser operates within a wavelength range highly absorbed by both water and fat,[5] making it particularly suited for targeting subcutaneous tissues. By delivering energy through an interstitial micro radial fibre emitting at 360 degrees,[6-11] the laser can penetrate deeper layers without affecting surrounding tissues excessively, thus ensuring targeted thermal effects[12] that promote collagen remodelling and skin contraction.[13]

This article examines the mechanisms of action, clinical outcomes, and procedural considerations in using an interstitial laser for submental tightening, supported by evidence from recent studies.

Mechanisms of action of the interstitial laser for submental tightening

EndoliftX® has been shown to be highly effective in interacting with subcutaneous tissues due to its high absorption in water and adipose layers.[14,15] This high absorption leads to a controlled thermal effect that induces collagen denaturation[16] and subsequent neocollagenesis, a process where new collagen fibres are synthesized in response to tissue injury. By penetrating directly into the subcutaneous fat and dermis, EndoliftX® can also reduce adipose volume, enhancing skin tightening by reducing submental fullness.[17,18]

This mechanism distinguishes EndoliftX® laser from other wavelengths, such as the 1064 nm Nd:YAG laser, which primarily targets deeper tissues and is less effective in superficial fat reduction.[3] EndoliftX® energy is absorbed effectively at the depth where subcutaneous fat and collagenous tissues reside, allowing for a more concentrated delivery of heat that remodels the extracellular matrix and tightens the overlying skin.

Comparative efficacy of laser wavelengths

Various wavelengths in laser-assisted lipolysis have been studied for their efficacy in skin tightening and fat reduction, including 980 nm, 1064 nm, and 1444 nm.[5] Studies comparing the EndoliftX® wavelength with alternatives suggest a superior outcome in achieving both adipose reduction and skin contraction. For instance, Nd:YAG lasers at 1444 nm and 1320 nm also exhibit effective fat reduction; however, they often require higher energy settings and produce more variable results in skin contraction due to their lower water absorption coefficients.

In a study comparing different wavelengths for neck tightening, it was found that patients treated with EndoliftX® demonstrated better skin firmness and fat reduction with minimal adverse effects.[11,19-22] The higher absorption rate of EndoliftX® wavelength in water-rich tissues allows it to achieve effective temperatures for fat liquefaction and collagen remodelling without extensive thermal spread, reducing the risk of burns or unwanted tissue damage.

Skin laxity and collagen remodelling

The ability of lasers to promote collagen remodelling is essential for achieving sustained skin tightening. When collagen is heated to a threshold temperature of approximately 65°C, it undergoes partial denaturation, causing immediate shrinkage and initiating a healing response that results in new collagen deposition. This process, termed neocollagenesis, contributes to the long-term firmness and elasticity of the treated skin.[3] Studies have shown that the EndoliftX®, when used interstitially, induces sufficient thermal injury in collagen fibrils to promote a gradual, long-lasting tightening effect, making it particularly advantageous for areas prone to laxity, such as the submental region.

Patient selection and pre-treatment assessment

Selecting appropriate patients is crucial for maximizing the efficacy and safety of EndoliftX® laser treatment in submental tightening. Ideal candidates include individuals with mild to moderate skin laxity and excess submental fat but without significant skin redundancy or severe sag-

ging that might require surgical intervention. Medical histories are evaluated for contraindications such as keloid scarring, active skin infections, or recent skin treatments. Before the procedure, a thorough consultation should be conducted to set realistic expectations and discuss potential outcomes. Pre-treatment assessments typically include photographs, fat thickness measurements, and skin elasticity tests. These baseline data points allow for a precise evaluation of results during follow-up sessions.

Procedure: technical and safety aspects

EndoliftX® is performed under local anaesthesia, often with the patient in a semi-reclined position to provide optimal access to the submental region. A 300 m radial emission microfibre delivery system (ELX 300 Radial fibre) is inserted subdermally in a fan-like motion to cover the targeted area evenly. Energy settings vary, typically ranging from 4 to 6 watts, to ensure effective yet safe fat emulsification and collagen heating.[14]

Temperature monitoring is essential to avoid burns, with the skin's surface temperature kept below 40°C while the underlying tissue reaches the ideal threshold for collagen remodelling. Thermal control devices, such as infrared thermometers or thermocouples, can be used to prevent overheating. Following the procedure, patients are often advised to wear compression garments for several days to support the healing process and optimize skin retraction.

Post-procedure care and recovery

Post-operative care involves wearing a compression band for several days to minimize swelling and promote skin adhesion to underlying structures. Patients are advised to avoid strenuous activities for at least one week and are given instructions on gentle lymphatic drainage exercises to reduce fluid retention and enhance the healing process. Follow-up visits typically occur at one week, one month, and three months to assess progress and ensure optimal outcomes.

Clinical outcomes of EndoliftX® in submental tightening

The application of EndoliftX® for submental skin contraction has consistently shown positive outcomes across various clinical studies. This wavelength, absorbed effectively by water and fat, allows for precise subcutaneous targeting, resulting in both fat reduction and skin tightening. A study by Dias *et al.* highlighted that a single EndoliftX® session on the submental region reduced cheek and submental fat with noticeable skin retraction and decreased skin flaccidity two months post-treatment.[15] Patients exhibited significant improvements in skin texture and jawline definition, affirming the laser's efficacy.

In similar studies on neck contouring and skin tightening, a 1444 nm Nd:YAG laser (a close counterpart to the 1470 nm wavelength) demonstrated a comparable ability to reduce submental fat and improve cervicomental angle, an important aesthetic measure of the neck and jawline. Sarnoff (2013) reported that 79% of patients treated with the 1444 nm Nd:YAG laser saw improvements in their cervicomental angle, correlating with enhanced skin laxity and contour definition.[4]

Comparative effectiveness of EndoliftX® with other wavelengths

The EndoliftX® laser is uniquely absorbed by both water and fat, enabling efficient subcutaneous penetration. This characteristic distinguishes it from other laser wavelengths, such as the 980 nm diode laser or 1064 nm laser, which primarily target fat with limited efficacy in collagen contraction. In a study comparing 980 nm laser-assisted lipolysis with traditional liposuction, Valizadeh *et al.* (2015) found higher patient satisfaction in the laser group, with greater improvements in fat thickness reduction and skin tightening.[1] Although effective, these shorter wavelengths do not match the 1470, 1720, and 1940 nm lasers' dual targeting capability, which enhances both adipose reduction and collagen remodelling. Moreover, studies have compared the 1470 nm laser's efficiency with that of 1444 nm devices, commonly used for facial and neck rejuvenation. Mandour *et al.* (2020)[18] observed that the 1444 nm Nd:YAG laser effectively tightened the lower face and neck, with a 97% patient satisfaction rate and significant cervicomental angle improvement.[14] These outcomes suggest that EndoliftX®, with similar absorption properties but higher water affinity, may offer a superior alternative for patients seeking non-surgical facial contouring.

Safety and side effects

EndoliftX® demonstrates an excellent safety profile, with mild, transient side effects such as mild erythema, edema, and localized tenderness. In clinical evaluations, adverse effects were minimal and typically resolved within days

post-treatment. A retrospective evaluation of interstitial laser treatment in neck tightening by Zhao *et al.* (2013)[13] found no severe complications like burns or nerve damage, highlighting its safety in subcutaneous.[14] Laser-assisted procedures often carry a risk of thermal injury; however, real-time temperature monitoring and controlled energy delivery significantly reduce this risk in EndoliftX® treatments. This protocol ensures that skin surface temperatures do not exceed 40°C, while deep subcutaneous tissues reach ideal thresholds for collagen contraction and fat emulsification.[3]

Patient satisfaction and aesthetic impact

Patient satisfaction with EndoliftX® treatments is notably high. In studies evaluating submental lipolysis and skin tightening, patient-reported satisfaction levels frequently exceed 80%, with many patients noting improvements in submental contour, neck angle, and skin firmness. Wanitphakdeedecha *et al.* (2022) reported high satisfaction among patients undergoing submental fat reduction with a 1064 nm laser, an effect that likely translates well with the 1470 nm wavelength, given its superior absorption and fat-targeting properties.[2]

Additionally, assessments using aesthetic scales, such as the Global Aesthetic Improvement Scale and Cervicomental Angle Score, substantiate the EndoliftX® laser's effectiveness. In these studies, the majority of patients rated their results as "much improved", with a marked reduction in neck and chin fullness, enhanced jawline definition, and overall skin quality. This non-invasive option is particularly attractive to individuals who wish to avoid surgery, offering a rapid recovery time and fewer risks compared to traditional methods.[3]

Conclusions

The EndoliftX® with microfibre radial delivery system (ELX 300 Radial fibres) has proven to be a highly effective, minimally invasive solution for submental skin tightening and contouring. Through studies and clinical trials, this laser has demonstrated the ability to significantly reduce submental fat, improve skin laxity, and enhance the aesthetic profile of the jawline. The EndoliftX® wavelength's dual affinity for both water and fat enables controlled, targeted energy delivery, making it particularly effective in inducing collagen remodelling and long-lasting skin contraction.

The high patient satisfaction rates, minimal side effects, and measurable aesthetic improvements support the EndoliftX® laser as a viable alternative to traditional surgical neck lifts and liposuction for submental rejuvenation. Future research should aim to further refine treatment protocols, optimizing energy settings and fibre positioning for diverse patient demographics. Additionally, longitudinal studies exploring the durability of outcomes over multiple years will help solidify this technology's role in aesthetic dermatology. The EndoliftX® laser continues to pave the way for non-invasive submental and facial rejuvenation, offering patients a safe and effective pathway to enhance their appearance with minimal downtime.

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