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MICROPULSED MICROFOCUSED ULTRASOUND FOR LIFTING EFFECT

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ABSTRACT

With advancement in aesthetic technology, there has been a significant rise in demand for treatments that promote healthy aging and reduce the visible effects of natural aging. Among these innovations, microfocused ultrasound has gained recognition as one of the most effective and well-documented technologies for facial rejuvenation. With recent developments, the micropulsed (MP) mode was introduced, which, through faster pulses, thus minimizing patient discomfort during treatment. While this mode has traditionally been associated with facial fat reduction, it has not been associated with a face lift effect.

This descriptive observational study, based on the analysis of a clinical case, aimed to assess both facial fat reduction and the potential lifting effect resulting from the application of microfocused ultrasound in MP mode. Patient JML, a 42-year-old woman, underwent treatment with this technology, and facial changes were meticulously evaluated using the 3D Vectra H2 software, which provides precise, scientifically validated stereophotogrammetric analysis. The pre- and post-treatment measurements revealed not only the expected reduction in facial fat but also an unexpected lifting effect achieved with

the MP mode. These results highlight the potential of micropulsed microfocused ultrasound as an effective tool in facial rejuvenation treatments.

Keywords: Microfocused ultrasound; Ultraformer MPT; Face lift; Jowl reduction; Facial rejuvenation

ABSTRACT

With advancements in aesthetic technologies, the demand for treatments that promote healthy aging and mitigate the effects of natural aging has significantly increased. Microfocused ultrasound stands out as one of the most effective and well-documented technologies in this context. Technological evolution has introduced the MP mode of application, which, with higher-speed pulses, reduces patient discomfort during treatment. Traditionally, the MP mode is mainly associated with facial fat reduction, promoting a slimming effect but without the promise of a lifting effect. This descriptive observational study, based on the analysis of a clinical case, aimed to evaluate not only facial slimming but also the existence of a lifting effect resulting from the application of microfocused ultrasound in MP mode. The patient, JML, aged 42, underwent treatment with this technology, and the facial changes were thoroughly evaluated using the 3D Vectra H2 software, which allows for precise and scientifically validated stereophotogrammetric analysis. Measurements taken before and after the treatment demonstrated, in addition to the expected reduction in facial fat, a surprising lifting effect with the micropulsed mode, highlighting the relevance of this study for clinical practice.

Key-words: Microfocused ultrasound. Ultraformer MPT. Facial lifting. Jowl reduction. Facial rejuvenation

INTRODUCTION

The rapid advancements in the field of aesthetics have increasingly required collaboration across various disciplines to develop and refine safe techniques aimed at fulfilling individual's desire for improved physical appearance through minimally invasive methods. These techniques seek to improve facial aesthetics without compromising the natural and healthy aging process.

In this article, we explore the application of microfocused form (MFU) of the high-intensity focused ultrasound (HIFU), a relatively new technology that remains underrepresented in international literature, for facial aesthetic treatments aimed at rejuvenation, with a particular focus on jowl reduction.

The jowl region, commonly affected during the aging process, presents a common aesthetic concern characterized by sagging tissues along the lateral regions of the jawline, specifically between the chin and the anterior border of the masseter muscle. In this case study, we assess the outcomes of the proposed treatment using microfocused micropulsed ultrasound, analyzing and measuring its efficacy in promoting a more defined and rejuvenated facial contour.

HIFU is a well-established technology in the field of aesthetic medicine, recognized for its efficacy in rejuvenation procedures. Through the emission of focused ultrasonic waves, HIFU creates coagulation points and controlled necrosis within the layers of dermis and subcutaneous tissue, without causing surface damage (ablative effect). By prompting immediate tissue contraction in the facial planes, the technique stimulates neocollagenesis, the process of generating new collagen fibers, as well as the formation of elastin over time (Montezuma et al., 2023). As a result, HIFU generates a lifting effect and improves skin laxity.

The non-invasive nature of this technique allows practitioners to precisely target different areas of the face. The treatment is particularly recommended for individuals seeking to enhance skin firmness, reduce sagging, smooth fine lines, and achieve a rejuvenated appearance without the need for surgical intervention. Commonly treated areas include the face and neck (Kim, et al., 2018). The desired outcomes of HIFU are often visible immediately following treatment, though the effects continue to develop over several months due to ongoing collagen production. The longevity of these results can

range from six to 12 months, depending on factors such as skin type and post-procedure care (Kwon, et al., 2020, Chen, et al., 2021).

A significant study conducted by Choi et al. (2019) investigated the efficacy of microfocused ultrasound for improving facial sagging. The study demonstrated a significant enhancement in skin elasticity and overall appearance following multiple treatment sessions. As an advanced form of microfocused ultrasound technology, the micro-pulsed (MP) frequency mode utilizes high-frequency sound waves to penetrate deeper skin layers, generating a thermal effect on over 400 micro-coagulation points within the tissues. The MP mode offers enhanced precision by targeting deeper layers, including the SMAS (Superficial Muscular Aponeurotic System), the same layer treated during surgical facelift procedures. This enables the achievement of significant results without the need for invasive surgery.

The HIFU technique has gained widespread acceptance in the aesthetic market due to its proven effectiveness and safety as a non-invasive alternative for facial rejuvenation. However, it is crucial that such treatments are administered by qualified professionals who can consider the individual characteristics of each patient to optimize outcomes and minimize the risk of adverse effects. The personalization of the treatment and the expertise of the professional are essential to achieve safe and satisfactory results.

The Vectra H2 software has become an indispensable tool in the field of facial aesthetics, significantly contributing to more thoroughly documented, safe, and more effective treatments. Its application has become increasingly relevant among practitioners, particularly in non-invasive aesthetic procedures, where precision and customization are crucial. The Vectra H2 is an advanced 3D imaging system that provides a detailed, three-dimensional view of the patient's facial features, offering a comprehensive and personalized analysis of facial structures. This capability enhances treatment planning and allows for objective comparisons of pre- and post-procedure outcomes.

In this study, Vectra H2 was employed for treatment planning and the comparative evaluation of data collected at the beginning and end of the treatment, allowing for a rigorous assessment of the procedure’s effectiveness.

One of the main advantages of the Vectra H2 is its simulation feature, which enables practitioners to present patients with various potential outcomes of aesthetic interventions, such as rhinoplasty, facelifts, and fillers. This feature aids in aligning patient expectations with realistic outcomes, promoting clearer communication and reducing post-procedure dissatisfaction (Baker et al., 2019).

Additionally, the Vectra H2 system provides a detailed comparative analysis of pre- and post-procedure outcomes, documenting treatment progress. This documentation is valuable not only for clinical follow-up but also for marketing purposes, since the results can be presented in a visually impactful manner (Paz et al., 2021). The software also plays a crucial role in treatment planning, helping to identify areas that need intervention and selecting the most appropriate approaches for each patient. The 3D visualization capability allows for a more in-depth understanding of facial anatomy, leading to more precise and customized interventions (Dayan et al., 2020).

Given the growing demand for facial rejuvenation techniques that are effective, safe, and minimally invasive, the study of emerging technologies and treatment protocols is essential. Microfocused ultrasound, particularly in its micropulsed (MP) mode, has gained prominence for its ability to deliver impressive results, including both a lifting effect and reduction of localized fat in the submental region. The continuous evolution of ultrasound devices, along with the introduction of faster and more comfortable application modes have contributed to the increasing popularity of this technology among both professionals and patients.

This descriptive observational study aimed to assess the efficacy of microfocused ultrasound in MP mode, evaluating its ability to induce a lifting effect and promote facial slimming efficiently. The

significance of this study lies in its demonstration of the potential to created treatment protocols that reduce both the duration of procedures and overall treatment timeline, without compromising safety or efficacy. By presenting a clinical case involving the use of this technology, this article contributes to the existing knowledge surrounding microfocused ultrasound, highlighting these results as the first of their kind for this specific technology globally. The results reinforce the potential of microfocused ultrasound as a valuable tool in the practice of facial rejuvenation.

The primary objective of this study was to document the findings from a specific clinical case, wherein the application of microfocused ultrasound in MP mode resulted in a visible lifting effect, underscoring its potential as a promising alternative for non-surgical aesthetic treatments.

MATERIALS AND METHODS

The new MPT Ultraformer device features a micropulsed application mode, which is primarily designed for fat reduction, and typically not associated with generating a lifting effect. In this case, however, MP mode was used not only to target facial fat but also to assess its potential for promoting a lifting effect. 3D images were captured before and after treatment for evaluation using the Vectra H2 software, which demonstrated both a lifting effect and reduction in facial fat. The analysis was performed based on the following procedures:

Subjective examination: Patient JML, 42 years old, presented with aesthetic concerns related to the appearance of jowls and a desire to prevent premature facial aging. Despite maintaining healthy lifestyle habits, the patient suffers from type 1 diabetes.

Pre-application: The face was cleaned using a cotton pad and micellar water, followed by sanitization using a 70% alcohol swab to ensure proper asepsis. After thoroughly cleaning the skin, pre-treatment images were captured for later evaluation in the Vectra H2 system. The areas to be treated were then marked with a white pencil to ensure patient safety.

Markings were made in three specific areas:

Lateral side (Figure 1): The treatment area was demarcated with a vertical line 1 cm distal from the labial commissure (anterior border) and a vertical line with a 1 cm safety margin from the preauricular region (posterior border). Horizontal lines were drawn along the lower border of the zygomatic arch (upper line) and along the upper border of the mandibular body (lower line), with a 1 cm margin to avoid the marginal mandibular nerve. A horizontal line was then used to divide the area into two equal parts.

Submandibular region (Figure 2): For double chin treatment, a line was drawn along the lower inner border of the mandibular body, dividing it into seven segments, each corresponding to the 2.5 cm width of the transducer's application marks. In the jowl region, an oval-shaped boundary was drawn along the side of the mandible, with the marionette line serving as the anterior border.

Figure 1 - Marking of lateral facial region

Figure 2 - Double chin marking

MPT microfocused ultrasound was applied in MP mode, as follows:

Lateral facial region: A total of 110 blasts were administered on each side - 70 with a 4.5mm tip at 0.9 Joules, and 40 with a 3mm tip at 0.7 Joules. The transducer was positioned vertically along the base of the jaw and applied in a static manner, using a layer of conductive gel. The blasts were delivered in an anteroposterior direction with application lines spaced approximately 1.5 mm apart. Before each application, facial tissue traction was performed to reposition the tissues to their original positions by pulling them in a posterosuperior direction towards the temporal region, promoting tissue realignment.

Double chin region: A total 140 blasts were administered — 70 using a 4.5mm tip at 0.9 Joules and 70 using a 3mm tip at 0.7 Joules. The application was performed horizontally, parallel to the jaw, in columns of five, avoiding the bone and thyroid regions.

Jowl region: An additional 30 blasts were administered on each side of the jowl with the 4.5mm tip at 0.9 Joules, applied horizontally and parallel to the jawline, from the bottom to the top in static micro-pulsed (MP) configuration.

No additional treatment was administered to the patient until the results were collected.

RESULTS

The application of microfocused ultrasound in MP mod demonstrated significant results, particularly in terms of tissue contraction and volume reduction in the jowl region. Additionally, the Vectra H2 system revealed a lifting effect in the immediate post-treatment evaluation.

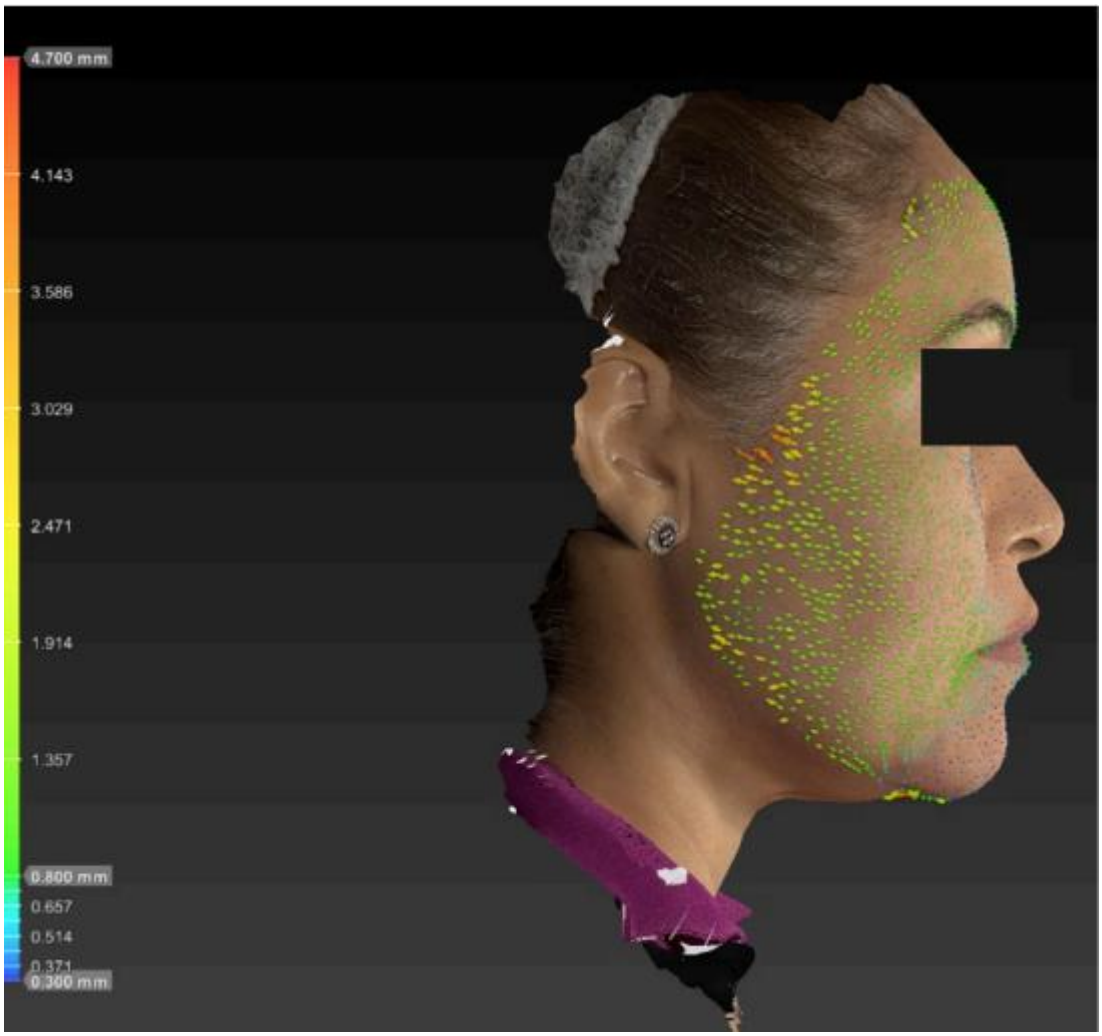

Figure 3 – Vectra H2 stereophotogrammetry displays the tissue displacement vectors from a lateral view. Colored arrows (D) indicate the direction of displacement, with their colors representing the amount of displacement in millimetres.

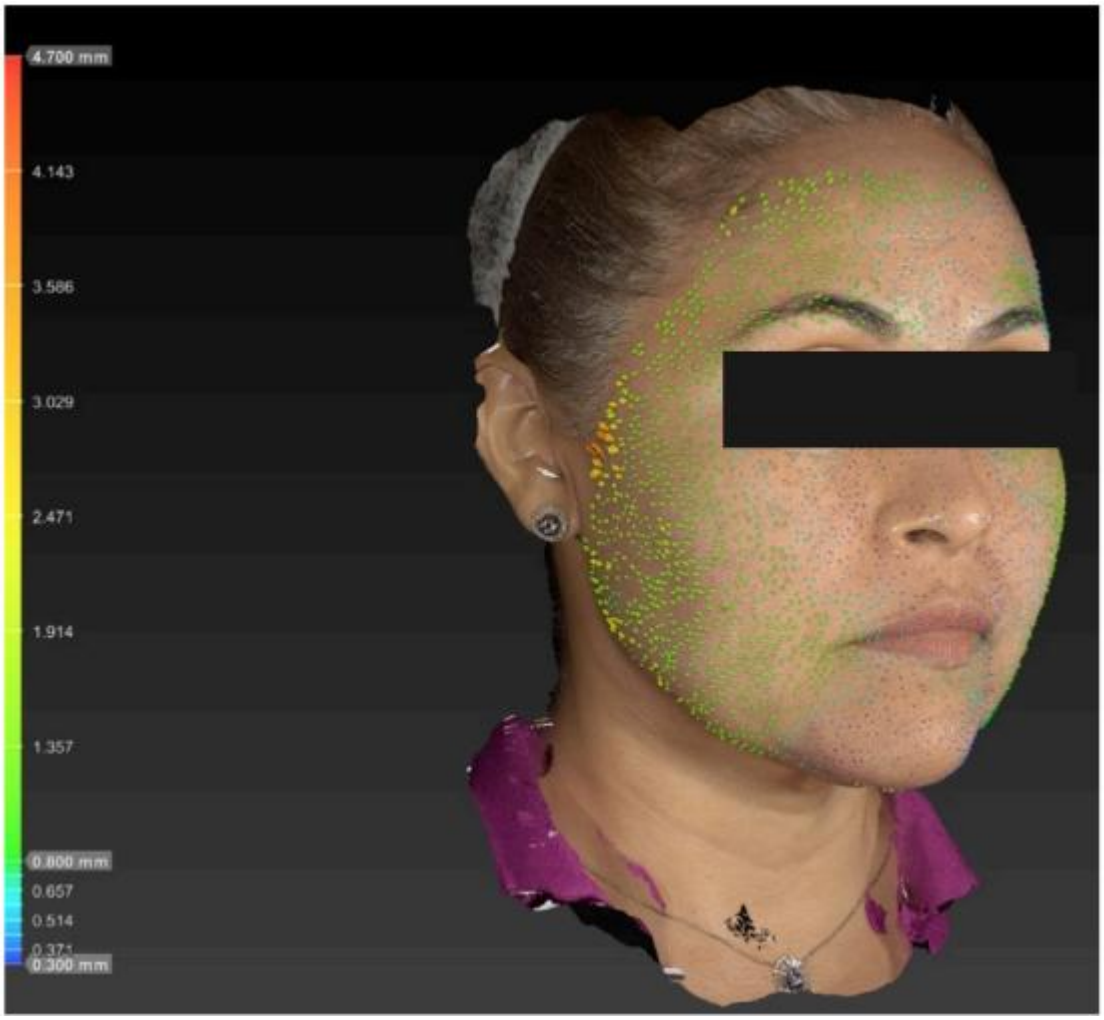

Figure 4- Vectra H2 stereophotogrammetry depicts tissue displacement vectors from a 45º view

Figures 3 and 4 illustrate the contraction and direction of tissue displacement, as measured by the Vectra H2, in the immediate post-application period.

LIFTING EFFECT RESULTS as measured	
Minimum lifting	0.80 mm
Maximum lifting	4.70 mm

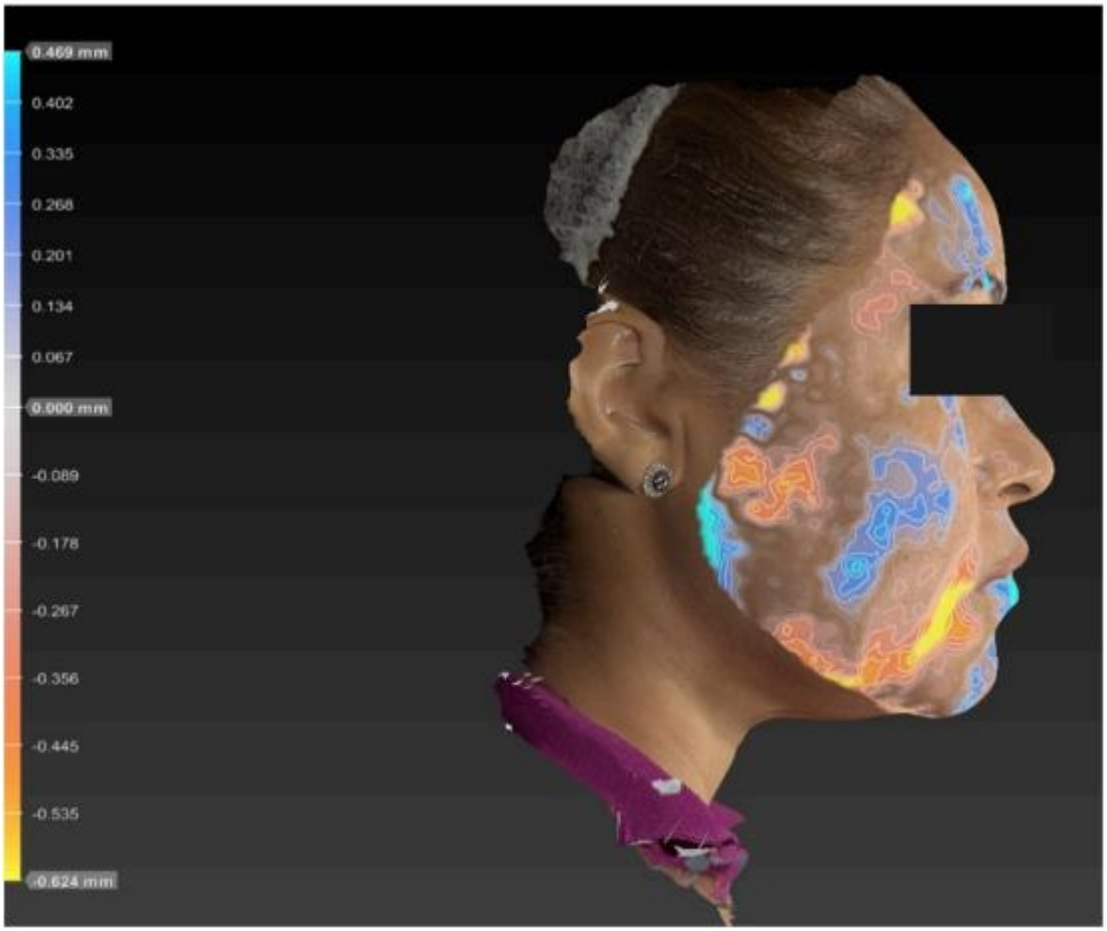

Figure 5 – Vectra H2 stereophotogrammetry show volume increase and loss from the side view

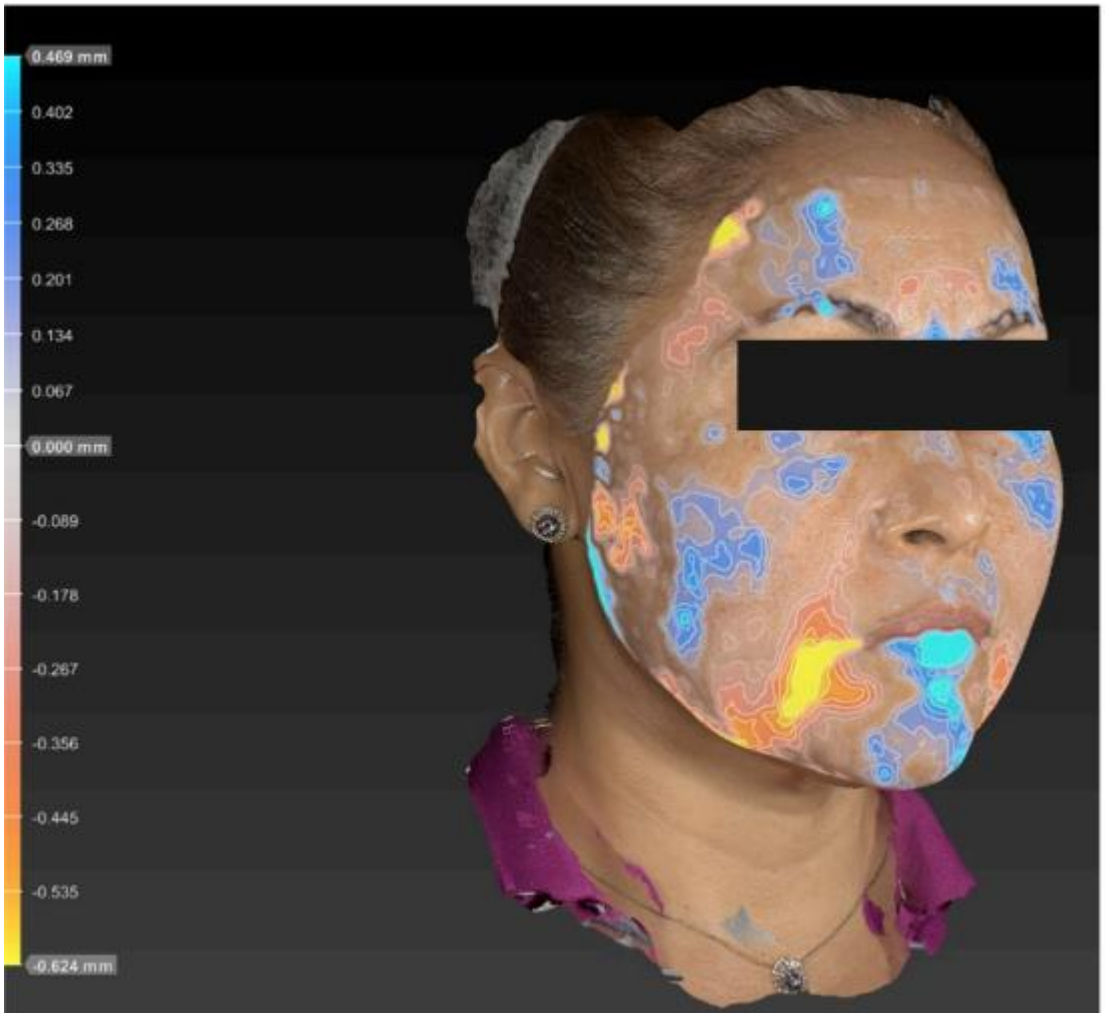

Figure 6 – Vectra H2 stereophotogrammetry shows volume increase and loss from a 45º view

Figures 5 and 6 show an increase in volume of approximately 0.335 mm in the blue-highlighted areas of the face, particularly around the jaw angle and cheek, suggesting tissue contraction in these regions. Conversely, in yellow and orange-highlighted regions, a volumetric loss of up to 0.624 mm was observed in areas such as the jowl and nasolabial region.

DISCUSSION

This study evaluated the effects of microfocused ultrasound in MP mode, a technology gaining increasing prominence in facial aesthetics due to its ability to deliver significant rejuvenation results through minimally invasive procedures. HIFU (High-Intensity Focused Ultrasound) technology, particularly in MP mode, offers a unique combination of efficacy and safety, making it an appealing alternative for individuals seeking aesthetic improvements without the risks and recovery time associated with surgical procedures. The application of microfocused ultrasound in MP mode involves delivering high-intensity energy to targeted focal points, creating thermal coagulation zones that stimulate neocollagenesis and tissue remodeling.

Previous studies, such as Alam et al. (2010), have demonstrated that microfocused ultrasound induces a lifting effect by stimulating the production of collagen and elastin, both of which are essential for skin firmness and elasticity. This lifting effect is particularly valuable for facial rejuvenation, as it combats sagging and enhances facial contours in a natural, non-surgical manner.

The results observed in this study are consistent with those reported by Montezuma et al. (2023), who documented improvements in skin quality and a lasting lifting effect in patients treated with microfocused ultrasound. While the longevity of the results may vary, they suggest that the effects can persist for extended periods, depending on individual factors such as age, skin type, and lifestyle. Tailoring the treatment by adjusting the energy levels and depth of the ultrasound application is essential to optimize results and address each patient's specific needs.

Previous research, including studies by Wulkan, Fabi, and Green (2014), has shown that the effects of microfocused ultrasound on the face and neck can last for more than six months, with many patients expressing satisfaction with the long-lasting outcomes. This extended effect is attributed to the continuous stimulation of collagen production and the immediate contraction of collagen fibers, followed by gradual remodeling over time. These characteristics make microfocused ultrasound a valuable tool not only for addressing skin sagging, as well as maintaining overall skin health and vitality.

Additionally, the combination of microfocused ultrasound with other aesthetic treatments, such as dermal fillers and botulinum toxin, can further enhance the rejuvenation effects, leading to even more comprehensive results. Integrating multiple techniques allows for a holistic approach to facial rejuvenation, addressing not only sagging but also other signs of aging, such as static wrinkles and volume loss.

While microfocused ultrasound is generally well tolerated, side effects may occur. Erythema, edema, and bruising are common but temporary, typically resolving within hours or days after treatment. Rare cases of hyperpigmentation or hypopigmentation have been reported, particularly in patients with darker or more sensitive skin types. More serious complications, such as facial nerve damage, are extremely rare and are usually associated with technical errors, such as improper device placement or incorrect equipment settings. Ensuring a trained and experienced team, along with adherence to evidence-based treatment protocols, is critical for minimizing these risks. Moreover, through pre-treatment evaluation, including analysis of the patient's skin condition and identification of contraindications, is essential for safe and effective outcomes.

The findings of this study suggest that MP-mode microfocused ultrasound is effective not only for facelifting and fat reduction but also offers a safe option for patients seeking minimally invasive rejuvenation. Further studies with larger sample sizes and longer follow-up periods will be essential to validate these results and establish standardized treatment protocols. This will improve the predictability of outcomes and provide clinicians with more robust guidelines for the use of this technology.

Replicating the methodology described in future research will be key to confirming these findings and developing standardized treatment protocols that can be widely adopted in clinical practice. By demonstrating the efficacy and safety of MP-mode microfocused ultrasound, this study contributes to advancement of facial rejuvenation techniques and fosters innovative therapeutic approaches to meet the growing demand for minimally invasive aesthetic procedures.

Future research could explore the interaction between microfocused ultrasound and other rejuvenation technologies, assessing not only its standalone efficacy but also the potential benefits of combining treatments. Additionally, personalizing treatment protocols to optimize outcomes based on individual patient characteristics has the potential to revolutionize the field of facial rejuvenation, offering more effective and safer solutions for maintaining youthful skin and enhancing skin health.

CONCLUSION

The findings of this clinical case demonstrate that the application of microfocused ultrasound technology in MP mode is capable of providing a significant facelifting effect, while also promoting facial slimming in a safe and effective manner. The observed positive outcomes further highlight the potential of this technology as a valuable non-surgical alternative for aesthetic treatments, offering visible benefits with reduced discomfort and shorter recovery times for patients.

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