

# Three-dimensional Analysis of Lifting Effects after High-intensity Focused Ultrasound (Ultraformer-MPT) across Seven Facial Aesthetic Units Considering SonoAnatomy

Jong Seo Kim, MD

**Background:** This investigation delves deep into the lifting degree for each area of noninvasive facial rejuvenation through high-intensity focused ultrasound (HIFU). The study meticulously examines the lifting effects of HIFU treatment across seven distinct facial aesthetic-units, using advanced three-dimensional scanner analysis.

**Methods:** The study examined a cohort of 50 patients treated with HIFU. Pre- and immediate posttreatment evaluations were conducted using three-dimensional scanner analysis, allowing for precise quantification of lifting effects across seven aesthetic units. Treatment protocols were tailored to leverage five cartridges with micropulsed mode options, optimizing outcomes based on sonographic anatomy.

**Results:** The forehead was lifted by 1.24 mm; crow's feet, 2.25; malar region, 2.46; posterior cheek, 3.40; jowl, 2.90; mandible, 3.09; and neck, 3.53.

**Conclusions:** The forehead showed a lift of 1.24 mm, attributed to the thin tissue requiring a cautious approach to avoid discomfort. A lift of 2.25 mm in the crow's feet area demonstrated the efficacy of HIFU in addressing fine lines and wrinkles. Significant lift of 2.47 mm in the malar region highlights HIFU's effectiveness in addressing mid-face laxity and restoring volume to the cheeks. The most substantial lift of 3.38 mm in the posterior cheek underscores targeted energy application for enhanced lifting and contouring. Notable lifting effect of 2.90 mm in the jowl area benefits sagging along the jawline, refining facial contour. Lift of 3.10 mm in the mandible shows improvement of lower facial laxity, defining the jawline. The highest lift of 3.55 mm in the neck region addresses laxity and sagging for a defined neck profile. (*Plast Reconstr Surg Glob Open* 2024; 12:e6203; doi: 10.1097/GOX.0000000000006203; Published online 4 October 2024.)

## INTRODUCTION

Facial aesthetics have long been a focal point of interest, with individuals seeking effective yet minimally invasive solutions for rejuvenation. In this context, high-intensity focused ultrasound (HIFU) has emerged as a promising modality, offering transformative effects without the need for surgery.<sup>1-4</sup> This study begins the journey of exploring the degree of regional lifting of HIFU treatment, with a particular focus on the micropulsed

(MP) mode of Ultraformer-MPT (UF-4; Classys, Seoul, Korea).<sup>5,6</sup> By unraveling the lifting effects across diverse facial units, the aim is to provide clinicians with a comprehensive understanding of HIFU's efficacy and its implications for patient care. Results reveal a nuanced tapestry of lifting effects, with notable emphasis on the posterior cheek, jawline, and neck regions. Through rigorous discussions encompassing the fundamental principles of HIFU, including depth targeting (Fig. 1), mode selection, and treatment protocols, the study offers insights into optimizing outcomes and ensuring patient satisfaction.

From the Kim-JongSeo Plastic Surgery Clinic, Seoul, Korea.

Received for publication June 12, 2024; accepted August 8, 2024.

Copyright © 2024 The Author. Published by Wolters Kluwer Health, Inc. on behalf of The American Society of Plastic Surgeons. This is an open-access article distributed under the terms of the [Creative Commons Attribution-Non Commercial-No Derivatives License 4.0 \(CCBY-NC-ND\)](https://creativecommons.org/licenses/by-nc-nd/4.0/), where it is permissible to download and share the work provided it is properly cited. The work cannot be changed in any way or used commercially without permission from the journal.

DOI: 10.1097/GOX.0000000000006203

Disclosure statements are at the end of this article, following the correspondence information.

Related Digital Media are available in the full-text version of the article on [www.PRSGlobalOpen.com](http://www.PRSGlobalOpen.com).

## METHODS

### Study Design

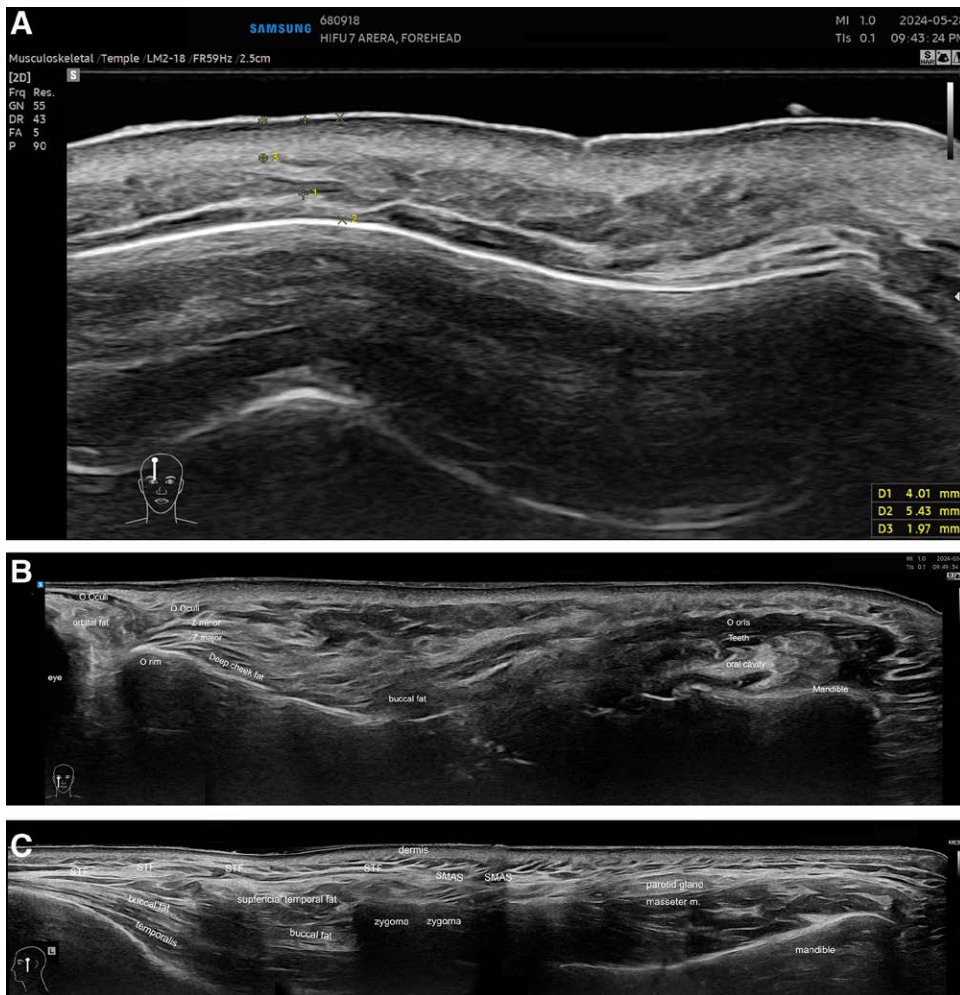
This retrospective single-clinic study analyzed pre- and posttreatment 3D scanner images to evaluate facial lifting across seven aesthetic units: forehead, crow's feet, malar, lateral cheek, jowl, jawline, and neck. Data were collected from January 2022 to January 2024 from 128 female patients who consented to use their 3D data for research. Of these, 50 patients aged 34–81 with accurately captured scans were selected for analysis. The study adhered to the Declaration of Helsinki, with all participants providing written consent before the procedure. Inclusion criteria targeted individuals with skin drooping suitable for continuous micro-focus ultrasound (CMFU) treatment, excluding those with pregnancy, active skin infections, or

### Takeaways

**Question:** The study seeks to determine the effectiveness of high-intensity focused ultrasound (HIFU) in achieving noninvasive lifting across seven facial aesthetic units.

**Findings:** The study involved treating 50 patients with HIFU by three-dimensional scanner analysis. The results showed significant lifting effects across seven areas, with highest lift observed in the neck region (3.55 mm) and the most substantial overall improvements noted in areas with thicker tissue, such as the posterior cheek (3.38 mm). The study confirms HIFU efficacy in addressing facial laxity and contouring.

**Meaning:** This study demonstrates that HIFU is an effective noninvasive treatment for achieving significant lifting and contouring across seven facial areas.



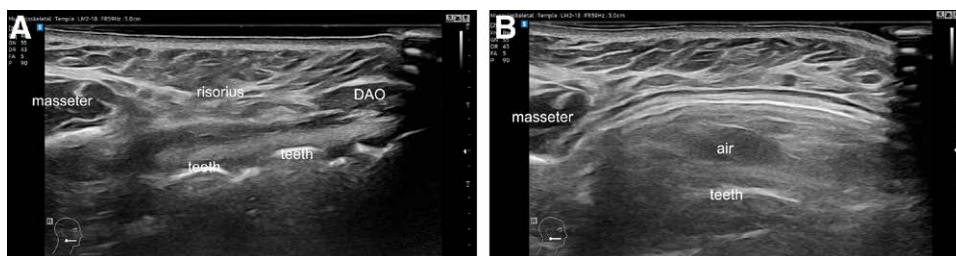
**Fig. 1.** Soft tissue ultrasound anatomy for cartilage localization. Including depth targeting (Figure 1sono), mode selection, and treatment protocols, the study offers insights into optimizing outcomes and ensuring patient satisfaction. Dermis thickness in forehead was 1.9 mm, temple was 1.5 mm, periorbital (crow's feet) area was 1.3 mm, anterior cheek was 2.4 mm, jowl was 1.7 mm, and mandible was 1.8 mm. The SMAS and the dermis are interconnected by numerous fibrous septae and fascia. These structures play a crucial role in maintaining the anatomical support and contour of the face. Enhancing the elasticity of these components is essential for preserving facial firmness and youthfulness. HIFU treatments are highly effective in increasing the elasticity of the fibrous septae and fascia, thereby contributing to facial rejuvenation. A, Vertical view of forehead on mid pupil line. B, Vertical view of anterior facial area on the mid pupil line. C, Vertical view of posterior facial area from temple, zygoma arch, and masseter muscle. Superficial temporal fascia is continuous to SMAS, and deep temporal fascia is continuous with masseteric parotid fascia.

specific medical conditions affecting treatment safety or efficacy.

### Treatment Protocol

The procedure commenced with a preliminary examination of ultrasound images of soft tissue in seven areas (Fig. 1). The treatment protocol involved the utilization of cartridges with MP-mode. A total of 700 shots were administered for a full-face treatment for all subjects. The energy level was set to the maximum power level, except for the 3-mm handpiece (0.6J).

1. A 1.5-mm booster cartridge was used initially in 150-shot quantities with glutathione-gel for skin whitening and tightening. A zigzag pattern was applied on whole facial areas, including the lower eyelid, forehead, lip area, and neck with zigzag pattern. It moves slowly in the beginning. If patients felt a tingling sensation, it got faster and faster.
2. A 3-mm booster cartridge was used to target subcutaneous and superficial fat compartments with 150-shots. Treatment was administered horizontally and vertically, focusing on fat compartments such as NL-fat, jowl-fat, and submental fat (Fig. 1). The technique involves gently massaging the entire face, starting from the jawline and lifting the skin upwards toward the center of the face. The cartridge is moved slowly initially, increasing speed upon patient feedback of heat sensation. For areas like submental and jowl-fat, a “static method” allows for precise and intense ultrasound emission.
3. Deep tissue treatment was conducted with a 4.5-mm booster tip using 100-shots, avoiding forehead (Fig. 1A) and thyroid cartridge area. During 4.5-mm treatment, all patients received HIFU treatment by puffing the cheeks by blowing air into the cheek to prevent tooth damage safely (Fig. 2). This “balloon blowing method” was invented by the author in 2013, using the principle that ultrasound waves cannot pass through air. In the face area, the target was superficial musculoaponeurotic system (SMAS)
- and deep fat. In the neck, the target was mainly the supra-platysma fat (Fig. 1B, C). When treating obese patients, the cartridge was treated with strong pressure to treat deeper tissue. It does not shoot into the forehead. The lifting effect is enhanced when the treatment is performed by sweeping the skin from bottom to top. To create a more lifting effect, tilt the tip to create an angle. When ultrasonic waves are irradiated with strong pressure with tilting up, the coagulation point is formed into an oval shape and lifting is created to a higher level. [See Video (online), which displays enhancing facial lifting with the “tilting and push-up technique” during HIFU.] A coagulation point is created where the lower superficial tissue connects to the deeper tissue above. The author’s “tilting and push-up” method led to stronger lifting results.
4. The 2-mm narrow cartridge has an effective emission film width of 2 mm and a length of 25 mm, whereas the standard cartridge measures 40 mm in length and 5 mm in width. This cartridge covered the entire face area using 200-shots, including the forehead, lower lid, around lips, and neck. Facial anatomy was not a primary consideration with this depth. The cartridge was placed horizontally on the jaw line and the skin tissue was swept upward from the bottom to reach the cheekbones and temples. The treatment was performed by sweeping upward from the back of the face, and the treatment was repeated in three parallel lines on one side. Then, the treatment was performed by creating three parallel lines from the center of the face to the lateral side, including forehead, upper and lower lip, and upper and lower eyelid.
5. The final step involved the application of a 3-mm cartridge to enhance lifting effects on fat compartments using 100-shots. Care was taken to avoid direct shots on the forehead. Techniques such as vertical and horizontal movements, along with tilting and push-up maneuvers, were used for optimal lifting results. [See Video (online).] The energy level of the 3-mm



**Fig. 2.** Air insufflation technique by the author for tooth protection during 4.5-mm HIFU treatment using ultrasound wave blocking property. The 4.5-mm booster tip was used for deep tissue treatment, excluding the forehead and thyroid cartilage areas. During the 4.5-mm treatment, all patients underwent HIFU treatment with a cheek puffing technique, known as the “balloon blowing method,” pioneered by the author in 2013. This method capitalizes on the principle that ultrasound waves cannot penetrate air. By inflating the cheeks, the ultrasound waves are effectively blocked from reaching the inner teeth, thereby safeguarding them from potential damage. A, Normal condition without air. B, Inflated state with air blown into the oral cavity.

cartridge was 0.5 for thin faces, 0.6 for average people, and 0.7 for very obese people. The cartridge was placed horizontally on the jaw line and the skin tissue was swept upward from the bottom to reach the cheekbones and temples using the tilting and push-up method. The treatment was performed by sweeping upward from the back of the face, and the treatment was repeated in three parallel lines on one side. Then, the treatment was performed by creating three parallel lines from the center of the face outwards.

**Evaluation**

In this study, a rigorous scientific methodology, the 3D-photographic imaging system LifeViz Mini (QuantifiCare Sophia Antipolis, France), was used to assess the efficacy of facial lifting across seven distinct anatomical regions before and after. Using this technology, the extent of lift can be quantified in each detail area, allowing for precise measurements of improvement. The quantification of measurements was performed using a 3D-analysis program, which scientifically calculates the degree of lifting at each point by analyzing the pre- and postprocedural scans. This process ensures objective measurements independent of human reviewers, ensuring accuracy and reliability in the assessment of lifting effects.

**Statistical Analysis**

Statistical analysis was conducted using paired *t* tests to assess the significance of the differences between pre- and posttreatment measurements, with a significance threshold set at a *P* value less than 0.05 for a two-tailed test. All analyses were performed using SPSS version 25.0, which facilitated data normalization, statistical testing, and visualization. Results were reported as mean ± SD, and critical *t* test values were calculated based on degrees of freedom to determine statistical significance.

**Global Aesthetic Improvement Scale**

The Global Aesthetic Improvement Scale (GAIS) was used to measure patient satisfaction and assess the degree of lifting and skin elasticity improvements across seven facial areas. This survey provided essential feedback on patient satisfaction and specific aesthetic enhancements posttreatment.<sup>7,8</sup>

**Aftercare**

After 3D imaging, 1 mL of stem cell media (gold stem ampoule) was sprayed under high pressure using a medical spray device (Jet Clear) to ensure deep penetration into the epidermis. The area was then covered with plastic wrap for one hour to form an occlusive dressing. This stem cell media, containing EGF, 24K-Gold powder, niacin-amide, adenosine, and 1% hyaluronic acid, aids in rapid skin recovery from heat damage by promoting regeneration and collagen production, thus improving skin texture and reducing wrinkles.

**RESULTS**

The average age of the patients was 45.6 ± 12.3 years, with a gender distribution of 11 men (22%) and 39 women (78%). The SMAS and the dermis were found to be interconnected by numerous fibrous septae and fascia. These structures played a crucial role in maintaining the anatomical support and contour of the face. Enhancing the elasticity of these components was essential for preserving facial firmness and youthfulness. HIFU treatments were found to be highly effective in increasing the elasticity of the fibrous septae and fascia (Fig. 1), thereby contributing to facial rejuvenation. The superficial temporal fascia was found to be continuous with the SMAS, and the deep temporal fascia was found to be continuous with the masseteric parotid fascia (Fig. 1B, C)<sup>9,10</sup>. The quantitative assessment of facial lifting across seven aesthetic units yielded the following findings (Table 1 and Fig. 3).

**Forehead**

The observed lifting amount for the forehead was measured at 1.24 ± 0.58 mm. This relatively modest increase can be attributed to the thinness of the soft tissue in this region, which necessitates a cautious approach to avoid discomfort during treatment (Figs. 1A and 4A, B).

**Crow’s Feet**

Analysis revealed a lifting effect of 2.25 ± 0.67 mm in the crow’s feet area. This improvement underscores the efficacy of HIFU treatment in addressing fine lines and wrinkles around the delicate periorbital region, contributing to a more youthful and rejuvenated appearance (Fig. 5).

**Table 1. Significance of Facial Lifting Procedure: Paired *t* Test Findings and GAIS**

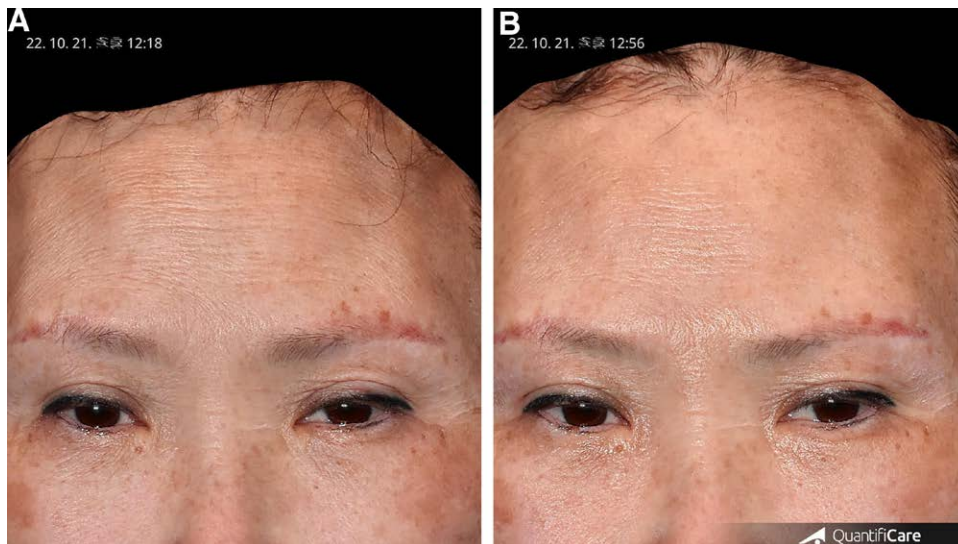
Seven Facial Areas	Mean	SD	<i>P</i> , One-tailed Test	<i>P</i> , Two-tailed Test	GAIS
Forehead	1.246666667	0.586597	0.005045076	0.010090151	3.9 ± 0.7
Crow’s feet	2.2552	0.677288	8.78433E-18	1.75687E-17	3.4 ± 0.6
Malar region	2.474190476	1.096823	2.08151E-15	4.16301E-15	3.2 ± 0.7
Posterior cheek	3.382142857	0.943536	4.07132E-26	8.14265E-26	3.1 ± 0.7
Jowl	2.905737705	1.107517	6.68311E-20	1.33662E-19	4.1 ± 0.8
Mandible	3.106842105	0.84871655	5.65923E-26	1.13185E-25	4.2 ± 0.7
Neck	3.553148148	1.3477	1.48445E-19	2.96891E-19	4.5 ± 0.5

The results obtained from the 3D scanner after performing a facial lifting procedure indicate statistical significance. The paired *t* test analysis from 3D scanner data shows statistically significant improvements in facial dimensions after the lifting treatment. This confirms that the treatment had a measurable impact, with significant differences noted between pretreatment and posttreatment facial features. These results suggest that the procedure resulted in visible changes to the facial structure, although detailed analysis would be necessary to fully understand the extent and specific nature of these changes. Statistically, for a result to be considered significant, the *P* value must be less than the predetermined significance level (*α*). Commonly used thresholds are 0.05 for moderate, 0.01 for strong, and 0.001 for very strong statistical significance.

Downloaded from http://journals.lww.com/prsgo by BhdMf5eP4Kav1zEoum1tQINa+KJLHEZgshHo4XM10i0CwycX1A on 11/11/2024



**Fig. 3.** Quantitative assessment of facial lifting effects across seven aesthetic units. Before and after 3D images showcase a comprehensive quantitative assessment of facial lifting effects across seven aesthetic units. The accompanying Table 1 furnishes detailed findings. A, Preprocedure. B, Immediately postprocedure. C, Postprocedure outcomes with directional arrows denoting the degree of lifting attained.



**Fig. 4.** 3D quantitative analysis of forehead lifting effects with improvement of wrinkles. A, Preprocedure. B, Immediate postprocedure stage demonstrating a significant improvement in forehead wrinkles.

**Malar Region**

The malar region exhibited a lifting amount of  $2.46 \pm 1.09$  mm. This significant enhancement highlights the efficacy of HIFU in addressing mid-face laxity and restoring volume and contour to the cheeks (Fig. 1B).

**Posterior Cheek**

The posterior cheek demonstrated the most substantial lifting effect, measuring at  $3.40 \pm 0.943$  mm. This pronounced improvement underscores the targeted application of HIFU energy to deeper tissue planes, resulting in enhanced lifting and contouring of the mid-face region (Fig. 1C).

**Jowl**

Analysis revealed a notable lifting effect in the jowl area, with an observed increase of  $2.90 \pm 1.10$  mm. This improvement is particularly beneficial in addressing sagging and

laxity along the jawline, contributing to a more defined and sculpted facial contour (Figs. 1B and 6).

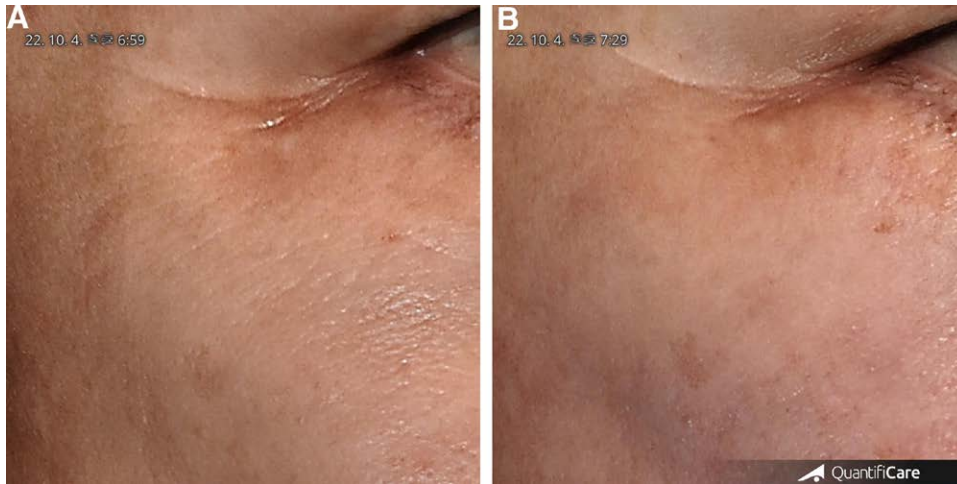
**Mandible**

The mandible exhibited a lifting amount of  $3.09 \pm 0.84$  mm. This enhancement is indicative of the efficacy of HIFU in addressing lower facial laxity and restoring definition to the jawline, thereby contributing to a more youthful and rejuvenated appearance (Fig. 7).

**Neck**

The neck region demonstrated the highest lifting effect, measuring at  $3.53 \pm 1.34$  mm. This substantial improvement underscores the versatility of HIFU in addressing laxity and sagging in the submental and cervical regions, resulting in a more defined and contoured neck profile (Fig. 1B, C and Fig. 8A, B).

Downloaded from http://journals.lww.com/prsgo by BHDMSepHKav1zEumt1QINa+KLLHEZgpsiHo4XMIONCwCX1A WNYQp/IOHrHD33DDODfRy7TVSFAc3VC4OAVpDDa8KKGKv0Vmy+78= on 11/11/2024



**Fig. 5.** 3D quantitative assessment of lifting effects in the crow's feet area. A, Preprocedure. B, Immediately postprocedure. This improvement highlights the effectiveness of HIFU treatment in addressing fine lines and wrinkles around the delicate periorbital region, leading to a more youthful and rejuvenated appearance. The illustration depicts the improvement in crow's feet wrinkles, showcasing the efficacy of the treatment.



**Fig. 6.** Facial contour enhancement and wrinkle reduction around the jowl areas. A, Preprocedure. B, Immediately postprocedure. This improvement is particularly beneficial in addressing sagging and laxity around the jowl. Significant improvement is evident in the reduction of wrinkles around the cheeks, jowl, and mouth area.

These findings collectively underscore the efficacy of HIFU treatment in achieving significant facial lifting and rejuvenation across multiple aesthetic units, with particularly pronounced effects observed in the posterior cheek and neck regions. By tailoring treatment parameters to target specific anatomical concerns, clinicians can optimize outcomes and deliver personalized care to patients seeking noninvasive facial rejuvenation (Fig. 9).

A paired *t* test was conducted with a significance level of 0.05 to evaluate the treatment's effectiveness. Results for the forehead showed a statistically significant difference with a *P* value of 0.010, indicating a mean increase of 1.246 and a variance of 0.351, confirming that the treatment improved the measured outcomes (Table 1).

GAIS satisfaction level regarding the degree of lifting and improvement in skin elasticity for each part of the seven

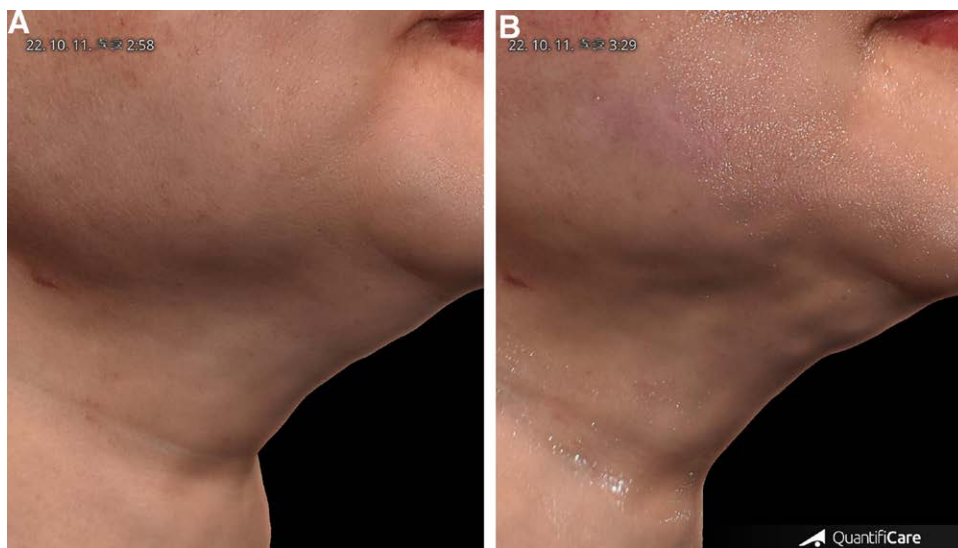
facial aesthetic units was recorded. GAIS score for the forehead was  $3.9 \pm 0.7$ , crow's feet was  $3.4 \pm 0.6$ , malar region was  $3.2 \pm 0.7$ , posterior cheek was  $3.1 \pm 0.7$ , jowl was  $4.1 \pm 0.8$ , mandible was  $4.2 \pm 0.7$ , and neck was  $4.5 \pm 0.5$  (Table 1).

## DISCUSSION

Today's discourse heralds an era of innovation in the realm of HIFU, with a spotlight on the revolutionary MP-mode (continuous mode). The author named the MP-mode of UF-4 as CMFU. Before delving into the crux of our discussion, it is imperative to elucidate the fundamental principles underpinning HIFU technology. At its core, HIFU harnesses the power of sound, a ubiquitous form of vibration that propagates as audible mechanical waves. As humans, we perceive sound within the frequency



**Fig. 7.** Jawline definition and facial laxity improvement with HIFU treatment. A, Preprocedure. B, Immediately postprocedure. This enhancement is indicative of the efficacy of HIFU in addressing lower facial laxity and restoring definition to the jawline, thereby contributing to a more youthful and rejuvenated appearance. The sagging areas along the jawline appeared smoother and more defined post-treatment, indicating a transformation from a saggy contour to a sleek jawline.

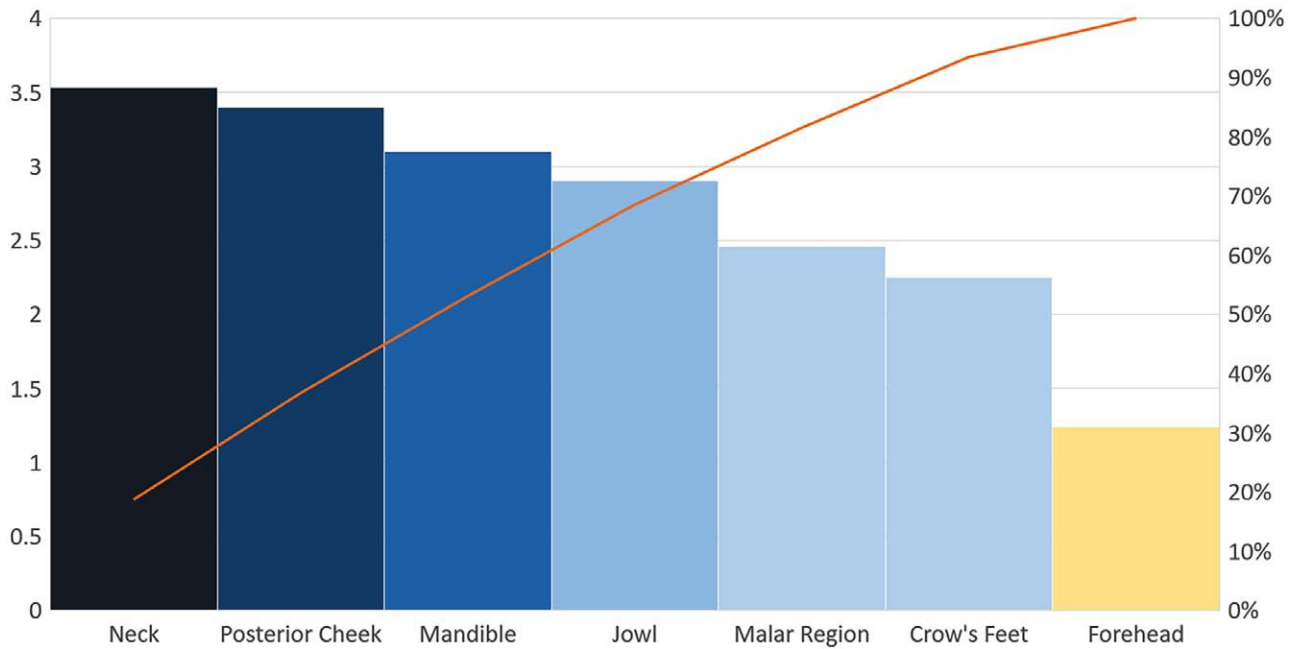


**Fig. 8.** Enhancement of neck contour and reduction of submental fat with HIFU treatment. A, Preprocedure. B, Immediate postprocedure. This substantial improvement underscores the versatility of HIFU in addressing laxity and sagging in the submental and cervical regions, resulting in a more defined and contoured neck profile. The reduction in neck wrinkles and the emergence of skin elasticity in the neck area have led to improved neck lines from the lateral perspective, while a decrease in submental fat volume is also apparent.

range of 20–20,000 Hz, with low-frequency waves capable of traversing vast distances. This is similar to the mechanism elephants use to communicate when taking heavy steps. In the context of HIFU treatment, frequency plays a pivotal role, dictating the depth of penetration and therapeutic efficacy. Notably, the cartridges utilized in HIFU devices exhibit distinct frequencies, with 4MHz facilitating deeper tissue penetration compared with 7-MHz counterparts. This depth targeting, facilitated by precise focusing,

allows clinicians to tailor treatments to specific anatomical layers, ranging from 1.5-mm to 4-mm depths.

Face lifting procedures like thread lifting are effective but can be painful. HIFU offers a less painful alternative. The original Ulthera system utilizes micro-focused ultrasound in dot mode with cartridges of 1.5 mm, 3 mm, and 4.5 mm, allowing skin imaging during treatment, although with limited image resolution. In contrast, the upgraded Ultraformer-MPT (UF-4) supports a broader range of frequencies and depths, with



**Fig. 9.** Efficacy of HIFU treatment in facial lifting and rejuvenation: a comprehensive analysis. These findings collectively underscore the efficacy of HIFU treatment in achieving significant facial lifting and rejuvenation across multiple aesthetic units, with particularly pronounced effects observed in the posterior cheek and neck regions. By tailoring treatment parameters to target specific anatomical concerns, clinicians can optimize outcomes and deliver personalized care to patients seeking noninvasive facial rejuvenation. The graph demonstrates that lifting occurred in the neck, posterior cheek, mandible, jowl, malar, periorbital area, and forehead, in descending order.

ten cartridge types and options for dot mode or continuous operation, totaling 20 treatment settings. UF-4's versatility is enhanced by Food & Drug Administration–approval and the ability to tailor treatments to specific patient needs, making it a comprehensive tool for facial rejuvenation.<sup>11–13</sup> The introduction of CMFU enhances HIFU by combining continuous and dot-mode functionalities for improved lifting and contouring, while reducing discomfort and treatment time. This study focused on lifting rather than fine wrinkles, with further research planned to assess long-term effects and refine treatment protocols.

Although the forehead exhibited modest lifting effects, the posterior cheek, jawline, and neck emerged as focal points of significant improvement. This nuanced distribution can be attributed to the inherent anatomical differences and tissue characteristics unique to each facial region. For instance, the thin soft tissue of the forehead necessitates cautious treatment to avoid discomfort, whereas the deeper tissue planes of the posterior cheek and neck allow for more aggressive HIFU application, yielding pronounced lifting effects<sup>14</sup> (Fig. 1).

Furthermore, considerations regarding nerve anatomy and tissue response underscore the importance of tailored treatment protocols. The central facial region, harboring sensory and motor nerves close to the surface, demands a judicious approach to avoid discomfort and minimize the risk of nerve damage. In contrast, the posterior cheek and neck regions, characterized by deeper nerve pathways, afford greater latitude for aggressive treatment, resulting in enhanced lifting outcomes.

The forehead had the least amount of lifting, and the areas with the most lifting were the posterior cheek, jaw

line, and neck. The reason is that the soft tissue on the forehead is thin, so a large amount of HIFU radiation could not be irradiated<sup>9,10</sup> (Fig. 1). Also, if 3 mm was strongly irradiated, the forehead bone area was painful, so it had to be irradiated weakly, and a 4.5-mm cartridge was not used. The reason why there was a lot of lifting in the posterior cheek, jaw line, and neck area is probably because ultrasound could be focused with high energy on those areas. In the central part of the face, sensory and motor nerves travel to the surface, so when strong ultrasound is applied to the area where the nerves are, the patient suddenly feels very severe pain. Additionally, the central area of face is a risk of nerve damage when ultrasound is applied to repetitive nerves, and the patient may experience intermittent muscle spasm or twitching.<sup>15,16</sup> Therefore, it is recommended not to use the 4.5-mm cartridge in the central part of the face, and to be careful not to inject too strongly with the 3-mm cartridge. However, the second half of the face can be strongly irradiated with ultrasound because the nerves pass through a relatively deep location. Therefore, the author strongly treated the posterior cheek area of the face, and you can see that this area has been significantly lifted. Because the soft tissue in the neck area is relatively thin, very obese people are treated with a 4.5-mm cartridge, but thin people are not treated with a 4.5-mm cartridge. The neck area was treated using a large number of shots: 1.5-mm booster, 2-mm conventional cartridge, 3-mm booster, and 3-mm conventional cartridge.

This study evaluates the efficacy of CMFU for facial lifting, identifying both strengths and weaknesses. Weaknesses include a limited sample size of 50 patients, which may affect the generalizability of results, and the

study's execution at a single center, which might not reflect broader demographic variations. Additionally, although 3D scanner analysis was utilized, some subjectivity in measuring lifting effects remains. Strengths of the study include a comprehensive evaluation across seven facial units using advanced technology, adherence to ethical standards per the Declaration of Helsinki, detailed methodology for clear replicability, and clinical relevance highlighting effective areas for HIFU treatment.

The study monitored side effects like erythema, swelling, and glandular redness, consistent with previous findings affirming CMFU's safety. Patient satisfaction measured through the GAIS showed high satisfaction, with many noting improvements in facial laxity and rejuvenation. These outcomes underline the need for further studies to more comprehensively assess the long-term safety and efficacy of CMFU, and to validate patient-reported outcomes across diverse demographics. The study's focus was on lifting effectiveness, suggesting future research should also explore finer aspects of safety and patient satisfaction.

### CONCLUSIONS

This study represents a pivotal step forward in the quest for optimal facial rejuvenation techniques. By unraveling the intricate dynamics of HIFU treatment effects across facial aesthetic units, it provides clinicians with valuable insights into treatment optimization and patient care. UF-4 HIFU in MP-mode emerges as a beacon of innovation, offering unparalleled lifting, contouring, and rejuvenation effects with enhanced precision and efficacy. This treatment protocol utilizing MP-mode HIFU offers a systematic and effective approach to facial lifting. By incorporating specific cartridge selections and techniques, significant improvements in facial aesthetics were achieved across various aesthetic units. This protocol not only demonstrates promising outcomes in facial rejuvenation but also ensures patient safety and satisfaction.

The forehead showed a lift of 1.24mm, attributed to the thin tissue requiring a cautious approach to avoid discomfort. A lift of 2.25mm in the crow's feet area demonstrated the efficacy of HIFU in addressing fine lines and wrinkles. A significant lift of 2.47mm in the malar region highlights HIFU's effectiveness in addressing mid-face laxity and restoring volume to the cheeks. The most substantial lift of 3.38mm in the posterior cheek underscores targeted energy application for enhanced lifting and contouring. A notable lifting effect of 2.90mm in the jowl area benefits sagging along the jawline, refining facial contour. A lift of 3.10mm in the mandible shows improvement of lower facial laxity, defining the jawline. The highest lift of 3.55mm in the neck region addresses laxity and sagging for a defined neck profile.

**Jong Seo Kim, MD**

Kim-JongSeo Plastic Surgery Clinic  
2F Apgujung BD. 842 NonHyun-ro, GangNam-gu  
Seoul, Korea 06025

E-mail: [plastic@surgery.co.kr](mailto:plastic@surgery.co.kr)

Instagram: @reteenage

Web: [www.surgery.co.kr](http://www.surgery.co.kr)

### DISCLOSURE

The author has no financial interest to declare in relation to the content of this article.

### ACKNOWLEDGMENT

The author expresses thanks to Benjamin Ascher for support.

### REFERENCES

- Carruthers J, Carruthers A. Understanding the presentation of facial aging: implications for evidence-based rejuvenation. *Dermatol Surg*. 2010;36:1071–1076.
- Fabi SG, Goldman MP. The safety and efficacy of a novel micro-focused ultrasound device for non-invasive skin tightening of the face and neck. *J Drugs Dermatol*. 2014;13:1007–1012.
- White WM, Makin IRS, Barthe PG, et al. Selective creation of thermal injury zones in the superficial musculoaponeurotic system using intense ultrasound therapy. *Arch Facial Plast Surg*. 2007;9:22–29.
- Laubach HJ, Makin IRS, Barthe PG, et al. Intense focused ultrasound: evaluation of a new treatment modality for precise micro-coagulation within the skin. *Dermatol Surg*. 2008;34:727–734.
- Park HS, Kim JH, Lee JY, et al. High-intensity focused ultrasound for the treatment of wrinkles and skin laxity in the upper face. *J Cosmet Laser Ther*. 2020;22:27–32.
- Ling J, Zhao H. A systematic review and meta-analysis of the clinical efficacy and patients' satisfaction of micro-focused ultrasound (MFU) treatment for facial rejuvenation and tightening. *Aesth Plast Surg*. 2023;47:1806–823.
- Dover JS, Zelickson BD, Burns AJ. Results of a multicenter study of the safety and efficacy of a high-intensity focused ultrasound device for noninvasive body contouring. *Lasers Surg Med*. 2014;46:180–188.
- Gold MH, Biron JA. Clinical evaluation of a high-intensity focused ultrasound system for noninvasive body contouring: an open-label, single-arm, prospective study. *J Cosmet Dermatol*. 2019;18:1455–1461.
- Lee JY, Park ES, Kim KJ. Correlation of ultrasound imaging characteristics with clinical outcomes for facial skin tightening after high-intensity focused ultrasound treatment. *Ultrasound Med Biol*. 2018;44:1695–1702.
- Lee H-J, Kim HM, Ahn H-S, et al. Novel clinical anatomical consideration of the superficial and deep layers of the deep temporal fascia. *Plast Reconstr Surg*. 2024;153:591–599.
- Alam M, White LE, Martin N, et al. Ultrasound tightening of facial and neck skin: a rater-blinded prospective cohort study. *J Am Acad Dermatol*. 2010;62:262–269.
- Suh DH, Choi JH, Lee SJ, et al. Comparative histometric analysis of the effects of high-intensity focused ultrasound and radiofrequency on skin. *J Cosmet Laser Ther*. 2015;17:230–236.
- Dong H, Liu G, Ma Z, et al. Simulation study on the effect of high-intensity focused ultrasound on thermal lesion of biological tissue under different treatment modes. *Iran J Med Phys*. 2022;19:199–206.
- Smoczok M, Leonik S, Bergler-Czop B. High-intensity focused ultrasound technology as a non-surgical alternative to face lifting. *Dermatol Rev*. 2022;109:130–137.
- Foley JL, Little JW, Starr FL, et al. Image-guided HIFU neurolysis of peripheral nerves to treat spasticity and pain. *Ultrasound Med Biol*. 2004;30:1199–1207.
- Foley JL, Little JW, Starr FL, et al. Ultrasound-guided HIFU neurolysis of peripheral nerves to treat spasticity and pain. *IEEE Ultrasonics Symposium*. 2004;2:1351–1354.