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Yuri Yogya

yuri.yogya@gmail.com

Padjadjaran University

Case Report

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Posted Date: November 24th, 2026

DOI: https://doi.org/10.21203/rs.3.rs-11684994/v1

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Additional Declarations: Competing interest reported. Dr. Yuri Yogya, MD, is a speaker for Jeisys Med Inc., Seoul, Republic of Korea.

Low-Intensity Focused Ultrasound for Facial Volume Restoration: A Retrospective Case Series

Yuri Yogya, MD[1,2*],

1-Department of Dermatology and Venereology, Universitas Padjadjaran, Bandung, Indonesia

2-Klinik Utama The Specialist, Tangerang Selatan, Indonesia

***Corresponding Author**

Yuri Yoga, MD

Department of Dermatology and Venereology, Universitas Padjadjaran, Bandung, Indonesia

Email: yuri.yogya@gmail.com

Abstract

Purpose:

Loss of facial volume due to aging or lipoatrophy significantly impacts appearance and psychosocial well-being. This study reports preliminary clinical outcomes of a non-injectable alternative: low-intensity, linear-focused ultrasound for facial volume restoration.

Patients and methods:

This retrospective case series included three female patients (aged 39, 43, and 52 years) with temporal or malar hollowing who declined injectables. All were treated in 2024 at a single aesthetic center using the LinearZ device (Jeisys Medical Inc., South Korea). Treatment was individualized by region (0.2–0.4 J, 20–100 shots, 4.5 mm cartridges). Standardized photographs were obtained at baseline and follow-up (3 months for all patients, and up to 6 months for one). A board-certified dermatologist blinded to the procedure assessed outcomes by comparing photographs and patient feedback.

Results:

Patient 1 (39 years) showed sustained improvement in bilateral temporal volume and contour at 3 and 6 months. Patient 2 (52 years) demonstrated increased left cheek volume with improved symmetry at 3 months. Patient 3 (43 years) exhibited enhanced midface volume, mandibular contour, and reduced laxity following dual-region treatment at 3 months. No adverse events or safety concerns were reported

across patients. Improvements appeared gradually, consistent with remodeling processes rather than immediate filling.

Conclusion:

A single session of low-intensity, linear-focused ultrasound was associated with visible improvement in temporal and malar volume, as well as mandibular contour, without adverse events. These findings support the potential of subablative ultrasound as a safer, non-injectable alternative for mild to moderate facial volume loss. However, the small sample size, lack of volumetric measurements, and short follow-up limit generalizability. Controlled trials with objective endpoints and long-term evaluation are warranted.

Keywords: Adipose Tissue, Regeneration, Rejuvenation, Dermatologic Surgical Procedures, Ultrasonics, Treatment Outcome

Introduction

Loss of facial volume in areas such as the temples (temporal hollowing) and the cheeks (hollow cheeks) is a key component of aging and certain lipoatrophic conditions, with a high aesthetic and psychosocial impact[1]. Morphologically, atrophy of subcutaneous fat and underlying bone resorption generate a hollowed appearance that contributes to an aged look.[2] Loss of volume in the temples is recognized as an early sign of facial aging that often goes unnoticed by both the patient and the clinician.[3] This temporal hollowing confers a gaunt or skeletal appearance, associated with perceptions of illness or fatigue. [4] Quantitative imaging studies support the magnitude of these changes. For example, magnetic resonance imaging measurements show that soft-tissue thickness in the temporal region decreases by an average of ~3.4 mm from youth to old age, representing a significant percentage loss of volume across the entire face. [5] At the same time, the malar region and cheeks lose projection, accentuating facial shadows and nasolabial folds.

The literature describes that individuals with facial lipoatrophy may develop social anxiety and reduced confidence in their appearance. This psychological impact arises because visible signs of aging can be misread as tiredness or sadness, creating a discrepancy between an individual's self-perception and their external appearance that can lead to social isolation. [6,7] Likewise, even in the general population undergoing cosmetic rejuvenation, improvements in body image perception have been observed after correcting wrinkles and restoring volume, with reductions in dissatisfaction and distress related to appearance. [8]

In clinical practice, facial volume restoration is typically achieved with injectables. Soft tissue fillers such as hyaluronic acid, calcium hydroxyapatite, or polylactic acid are first-line treatments because they work immediately and are minimally invasive. Multiple studies support their efficacy in correcting temporal and malar hollowing. For example, a recent trial involving 75 patients demonstrated that a new cross-linked hyaluronic acid filler significantly improved volume deficits in the temples and maintained this volume for at least 12 months post-injection. [4] However, fillers are not without limitations. Their effect is temporary and requires periodic reinjections (every 6–18 months, depending on the material).[9] Although rare, severe complications have been reported: inadvertent injection of filler into the arterial tree can cause skin ischemia or even vascular embolization.[10] Areas such as the glabellar, nasal, and temporal regions are particularly delicate. A comprehensive 2024 review of world literature by Doyon et al. identified 511 cases of vision changes following filler injections, many of which were permanent. [1112]

Another widely used option is autologous fat grafting (lipofilling), which involves transferring adipose tissue from the patient to restore volume in areas such as the temples, cheeks, and folds. [13] When the graft integrates successfully, it can provide long-lasting results with a natural texture and appearance. However, the long-term viability of fat grafts is variable and unpredictable: systematic studies report widely disparate graft survival rates, typically ranging from 15% to 50% of the injected volume after 6–12 months, even with standardized techniques.[13]

Taken together, the limitations of injectables (temporary duration, need for reinjections, and risk of severe vascular complications) and the inconsistent survival

of fat grafts underscore an unmet clinical need for non-injectable, durable, and safer approaches to restore facial volume. This gap has motivated growing interest in energy-based technologies. Among them, high-intensity focused ultrasound (HIFU) and radiofrequency have gained attention for their ability to induce dermal tightening and, under specific parameters, modulate subcutaneous tissues. [14]

HIFU consists of high-frequency sound waves focused on specific points at controlled depths, producing localized thermal coagulation of the target tissue. [14] Initially introduced for ablative medical applications (such as tumor or prostate tissue destruction), HIFU was adapted more than a decade ago to the aesthetic field to achieve a nonsurgical lifting effect. [15] By delivering ultrasonic energy into the superficial musculoaponeurotic system and deep dermis, it induces immediate collagen contraction followed by neocollagenesis and elastogenesis over the subsequent weeks. The clinical result is skin tightening and wrinkle attenuation without the need for surgery. [16] A systematic review found that HIFU can improve laxity in the lower third of the face, neck, and periorbital region, with visible results from 8-12 weeks and lasting for approximately one year in many patients. In addition to its tightening effect, focused ultrasound has the capability (when using different parameters), to act on subcutaneous fat: at higher energies and targeted to the adipose panniculus, it has been successfully employed as a noninvasive lipolytic device (for example, to reduce submental fat or abdominal fat), inducing coagulative necrosis of adipocytes through thermal and cavitation effects. [16]

Despite the findings, a notable gap remains in clinical evidence for facial volume restoration in humans using non-injectable energy-based modalities. This case

series aims to provide preliminary observations to guide future research in this field. In our study, we present three clinical cases treated in 2024 with low-intensity, linear-focused ultrasound designed to stimulate subcutaneous adipose tissue proliferation in areas of facial volume loss (temporal hollowing and hollow cheeks).

Methods

Study Design and Setting

This observational, descriptive, and retrospective case series aimed to document the clinical evolution of patients with facial volume loss treated with LinearZ, a HIFU device (Jeisys Medical, Republic of Korea), capable of emitting low-intensity, linear-focused ultrasound waves, which is designed to stimulate adipose tissue proliferation and improve facial contour without the use of injectables. The patients were treated in 2024 at Klinik Utama the Specialist, an aesthetic practice center in Tangerang Selatan, Indonesia. This case series was conducted in accordance with the ethical principles of the Declaration of Helsinki.

Patient Selection

Adults with a clinical diagnosis of localized facial volume loss, with or without other associated facial alterations, who declined or had contraindications to injectable treatments and who provided informed consent were eligible for inclusion.

Exclusion criteria were pregnancy or breastfeeding, history of injectable aesthetic procedures within the previous six months, active skin disease in the treatment area, severe or uncontrolled systemic illnesses, or contraindications to focused ultrasound.

Facial Assessment

A board-certified dermatologist conducted the facial assessment. The clinician recorded facial volume loss and associated signs and symptoms of aging. The study also recorded patients' aesthetic concerns and desires, along with relevant medical, social, and psychosocial histories. Standardized photographic records were obtained in frontal, oblique, and lateral views.

Treatment Protocol

All patients underwent a single treatment session with the LinearZ in the supine position on clean skin, with clear gel applied and without local or systemic anesthesia. Parameters were individualized as follows, Table 1.

Follow-up and Outcome Assessment

Patients were assessed at baseline (Day 0) and at three months after treatment, and one patient was followed up to 6 months, the predefined main evaluation point for clinical outcomes. At each visit, standardized photographs were taken in frontal, oblique, and lateral views under consistent lighting and positioning conditions. Outcome assessment included evaluation of comparative photographs by a board-certified dermatologist blinded to the procedure and patient self-assessment regarding perceived changes. Secondary outcomes included monitoring for adverse events, treatment tolerance, and adherence.

Results

Three female patients of Indonesian descent were included in the case series, aged 39, 43, and 52 years, each meeting the inclusion criteria of presenting with localized

facial volume loss and/or hollowing and having declined injectable treatments. None had relevant comorbidities or a recent history of aesthetic procedures.

Patient 1

A 39-year-old female presented with bilateral temporal hollowing, characterized by progressive volume loss in both temporal regions over the past 12 months, resulting in a gaunt appearance and perceived facial aging. On examination, there was a marked loss of projection in the temples and lateral forehead contour. Treatment was performed using a linear cartridge (4.5 mm, 0.2 J), delivering 20 shots to the bilateral temporal regions. In all subfigures (Figures 1A–C), images are presented in the same order: baseline (left), 3-month follow-up (center), and late follow-up at 6 months (right). Figure 1A shows the frontal view, Figure 1B the right oblique view, and Figure 1C the left oblique view. At the 3-month follow-up, standardized photographs demonstrated visible volume restoration and improved lateral contour. At the 6-month follow-up, the improvement in temporal volume and contour was maintained. No adverse events occurred.

Patient 2

A 52-year-old female presented with a primary concern of facial asymmetry, characterized by a noticeable hollowing of the left cheek (frontal view, Figure 2A). The condition was first observed approximately three years ago and had gradually become more apparent, prompting aesthetic and functional concerns. Treatment was performed in 2024 using a linear cartridge, 4.5 mm, 0.2 J, delivering 50 shots to the left cheek. The main objective was to promote facial rebalancing and improve

hollowing without the use of injectables. In both views (Figures 2A and 2B), images are presented in the same order: baseline (left) and 3-month follow-up (right). The following gradually improved following treatment with Linear Z, resulting in enhanced facial symmetry. At the 3-month follow-up, standardized photographs demonstrated increased cheek volume and improved symmetry (right oblique view, Figure 2B). No adverse events occurred.

Patient 3

A 43-year-old woman presented in 2024 with concerns related to progressive facial aging, including skin laxity, jowling, and hollow cheeks (Figure 3A–C, baseline views). The patient reported a gradual onset of these changes over the past two years, accompanied by increasing dissatisfaction with the lower face contour and overall facial harmony. The patient underwent treatment with the LinearZ in a single session to address both volume loss and skin laxity. A first pass with a linear cartridge (4.5 mm, 0.2 J; 50 shots) was applied to the left cheek for hollowing, and a second pass using a linear cartridge (4.5 mm, 0.4 J; 100 shots) was performed on the mandibular region and lower third of the face to improve skin laxity and jowling. In all subfigures (Figure 3A–C), images are presented in the same order: baseline (left) and 3-month follow-up (right). At the 3-month follow-up, standardized frontal, right oblique, and left oblique photographs demonstrated increased midface volume, improved mandibular contour, and reduced laxity. No adverse events occurred.

Discussion

In this retrospective case series of three females (aged 39, 43, and 52 years), a single session of low-intensity focused ultrasound with region-specific, individualized parameters produced a visible improvement in malar/temporal volume and mandibular contour starting at month 3, without any adverse events. This temporal pattern and safety profile align with the clinical literature on microfocused ultrasound (MFU-V/HIFU) for facial rejuvenation, where the clinical effect typically consolidates between 3 and 6 months through progressive tissue remodeling rather than an immediate filling effect. In a systematic review[17] of MFU-V (16 studies; n ≥ 10 per study), objective improvement (brow lift of 0.47–1.7 mm; and submental lifts measured as a 26–45 mm² reduction in the submental area on lateral photographs) and subjective improvement (IGAIS/SGAIS) increased from day 90 to day 360, with adverse events mostly mild and transient (≈2%) and moderate pain, although with methodological heterogeneity and a lack of standardized volumetric measurements.

Beyond skin tightening, emerging preclinical data support an adipogenic effect of LIFU in the facial subcutaneous tissue, consistent with our hypothesis of conservative fat proliferation. In a porcine model, Byun et al. demonstrated increased malar fat thickness and volume, as measured by MRI, after LIFU, along with overexpression of HSP70, reduced NF-κB, and upregulated PPARγ/CEBPα, suggesting ciliary modulation of adipose-derived stem cells. [18] Consistently, Oh et al., in a rat model, demonstrated subcutaneous adipogenesis with sub-ablative LIFU, increased HSP70 expression, and decreased inflammatory mediators, with greater hypodermal thickness at 12 weeks. [19]

When positioning our non-injectable alternative against soft tissue fillers and autologous fat grafts, it is crucial to balance effectiveness and risk. Soft tissue fillers allow for immediate and precise correction, but even with guidance under ultrasound, there remains a rare yet devastating risk of vascular occlusion leading to necrosis or blindness. Doyon et al.[11] updated cases of filler-related blindness published between 2018 and 2023, highlighting that although rare, the complication carries a poor overall visual prognosis and is most concentrated in the glabellar and nasal regions. For facial fat grafts, Brucato et al. [20] compiled 58 complications in 38 patients from published case series and reports, with 32 classified as severe or permanent (e.g., hemiplegia, vision loss), showing higher risk in the forehead and temporal regions; the authors emphasize biases and underreporting, making the true incidence uncertain.

In comparison, our external approach avoids intravascular injection, virtually eliminating the risk of embolic ischemia; in exchange, it offers a more moderate and delayed volumetric effect, which may suffice for mild-to-moderate deficits or in patients who decline exogenous materials.

Strengths of this case series include standardized photography, blinded evaluation, consistent temporal improvement (as observed at month 3), and no adverse events. Our report has several limitations common to any case series, including a small sample size, the absence of a control group, a lack of objective 3D volumetric metric analysis, a short follow-up period (ideally ≥ 6–12 months), and parameter variability by region. These factors preclude accurate estimation of effect magnitude, durability, and reproducibility and caution against overgeneralization.

Prospective controlled studies are urgently needed, including 3D volumetric quantification, validated scales (e.g., GAIS/FACE-Q), patient-reported outcomes (PROs), and at least a 12-month follow-up. Head-to-head comparisons against fillers and fat grafts in equivalent indications are desirable, along with analyses of serial sessions and combination approaches, as well as human histologic studies that document adipogenesis, angiogenesis, and tissue integration.

Conclusion

In this case series, a single session of low-intensity, linear, focused ultrasound with region-targeted parameters was associated with visible improvement in malar/temporal volume and mandibular contour starting at month 3, with no adverse events. However, the magnitude, duration (> 6–12 months), and reproducibility of the volumetric effect remain undefined because objective measurements and controls are lacking.

Ethical Considerations & Consent to Publish

All patients provided written informed consent for treatment and use of identifiable photographs in publication. No institutional review board approval was required for this retrospective case series.

Funding

Jeisys Med Inc. (Seoul, Republic of Korea) provided the study device. The funder had no role in the design, conduct, data analysis, or interpretation of the results, and no influence on the drafting or approval of the manuscript.

Conflict of Interest Statement

Dr. Yuri Yogya, MD, is a speaker for Jeisys Med Inc., Seoul, Republic of Korea.

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Figure 1. Standardized photographs of a 39-year-old woman treated for bilateral temporal hollowing using the LinearZ device



(A) Frontal view at baseline (left), 3-month follow-up (center), and late follow-up at 6 months (right).

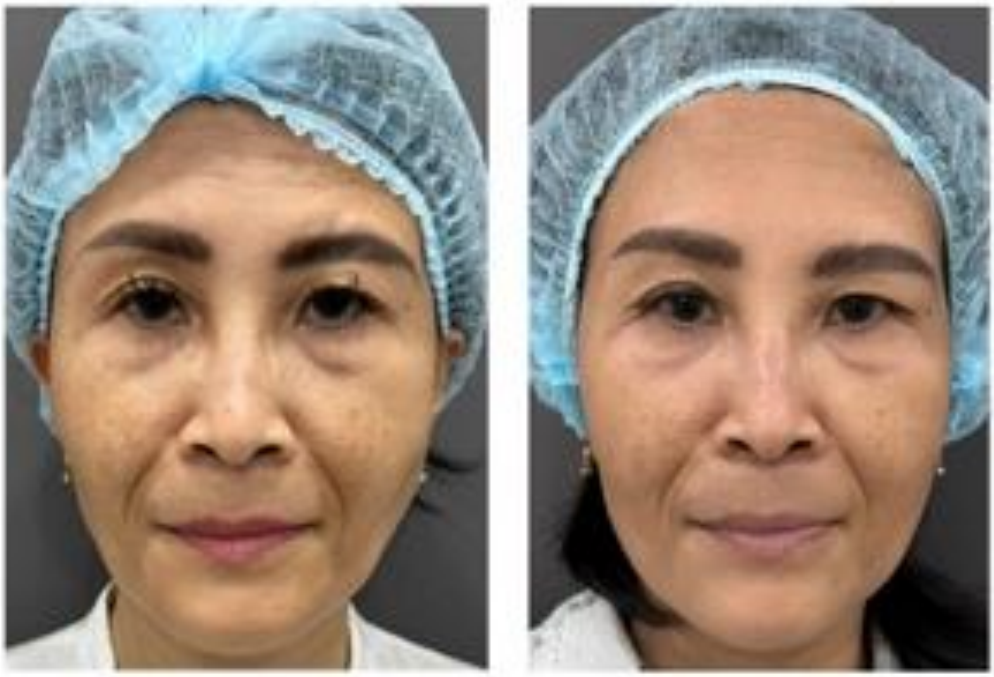


(B) Right oblique view at baseline (left), 3-month follow-up (center), and late follow-up at 6 months (right).



(C) Left oblique view at baseline (left), 3-month follow-up (center), and late follow-up 6 months (right).

Figure 2. Standardized photographs of a 52-year-old woman with left cheek hollowing treated with the Linear Z device.



(A) Frontal view at baseline (left) and 3-month follow-up (right).



(B) Right oblique view at baseline (left) and 3-month follow-up (right).

Figure 3. Standardized photographs of a 43-year-old woman with skin laxity, jowling, and hollow cheeks treated with the Linear Z device.



(A) Frontal view at baseline (left) and 3-month follow-up (right).



(B) Right oblique view at baseline (left) and 3-month follow-up (right).



(C) Left oblique view at baseline (left) and 3-month follow-up (right).

Table 1. Treatment characteristics and parameters for facial volume restoration cases

Patient	Cartridge (Core)	Energy (J)	Shots	Treatment Area(s)
1	Linear mode 4.5 mm	0.2	20	Bilateral temporal region
2	Linear mode 4.5 mm	0.2	50	Left cheek
3	Linear mode 4.5 mm	0.2	50	Cheek
	Linear mode 4.5 mm	0.4	100	Mandibular region and lower third (skin laxity and jowling)