ORIGINAL RESEARCH

High-frequency Ultrasound in the Assessment before and after Applying HArmonyCa™

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Abstract

Aim: To describe a clinical case of ultrasound (US) used to evaluate, before, post-immediately, and after 4 months, the facial application of a volumizing and biostimulating substance.

Background: Detecting the behavior of injected filler materials with high-frequency US-guided application is the future of natural facial rejuvenation with more predictable and satisfactory results.

Technique: A patient indicated for orofacial harmonization (OFH) procedures through volumizing and biostimulating material application was invited to participate. The technique was performed by applying HArmonyCa™ (Allergan Aesthetics, Irvine, CA, USA) in the gonial, preauricular, and bilateral lateral zygomatic angle regions. The first evaluations used the US images before and after product application with a Logiq e® high-frequency US device (GE Healthcare, Chicago, IL, USA) with a probe/linear transducer of 18 MHz. About 4 months after the procedure, a new assessment with the same initial acquisition pattern was performed. The first evaluation showed normal-looking anatomical structures without the esthetic material. Immediately after the procedure and 4 months later, the assessments presented semi-permanent esthetic fillers as dispersed lobulated hyperechogenic areas with a cloud aspect.

Conclusion: High-frequency US was efficient in the static evaluation of HArmonyCa™ behavior on the facial skin.

Clinical significance: The US-guided application of injectable products in specific areas has minimal side effects and contributes to more predictable and satisfactory results.

Keywords: Facial harmonization, Skin structure, Ultrasonography.

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Introduction

Ultrasound (US)/ultrasonography (USG) or echography (ECO) are current diagnostic methods but have been growing over the last few years due to the development of a new generation of equipment with high- and variable-frequency probes that allow the optimal definition of surface structures[1] noninvasively and without radiation.[2] They present fast acquisition times, producing real-time US images, allowing physical adjustments and optimized images, and representing a promptly available technology easily incorporated into clinical practice.[3]

In dermatology, using US started with fixed-frequency equipment (20–100 MHz), capable of distinguishing skin layers. However, fixed-frequency machines have low penetration (5–6 mm at 20 MHz, 3 mm at 75 MHz, and 1 mm at 100 MHz) and lack color Doppler capabilities.[4] In recent years, the development of US equipment with Doppler combining high-frequency transducers (above 15 MHz) and new post-processing technologies have allowed optimal facial skin layer definition and noninvasive and real-time assessments of superficial structures and venous and arterial vasculatures with unprecedented detail.[2,3]

In the orofacial harmonization (OFH) specialty, US use still requires an incipient routine application, but has been increasingly acknowledged over the last years, with OFH representing its primary referral.[1,2,5] That is because US analyzes fillers and biostimulators, substances with particular characteristics and densities.[3,6] As the search for naturalness and longevity of the volume restored with filler injections is among the desired outcomes of the current facial rejuvenation technique, detecting the behavior of the injected filler material and the US-guided application of injectable products in the appropriate plane in specific areas are the future of natural facial rejuvenation with minimal side effects,[7] contributing to more predictable and satisfactory results.

Therefore, the present study aims to investigate whether high-frequency US is effective in the static evaluation of HArmonyCa™ behavior on the facial skin at application sites, as well as in assessing volume gain and facial skin improvement through quantitative

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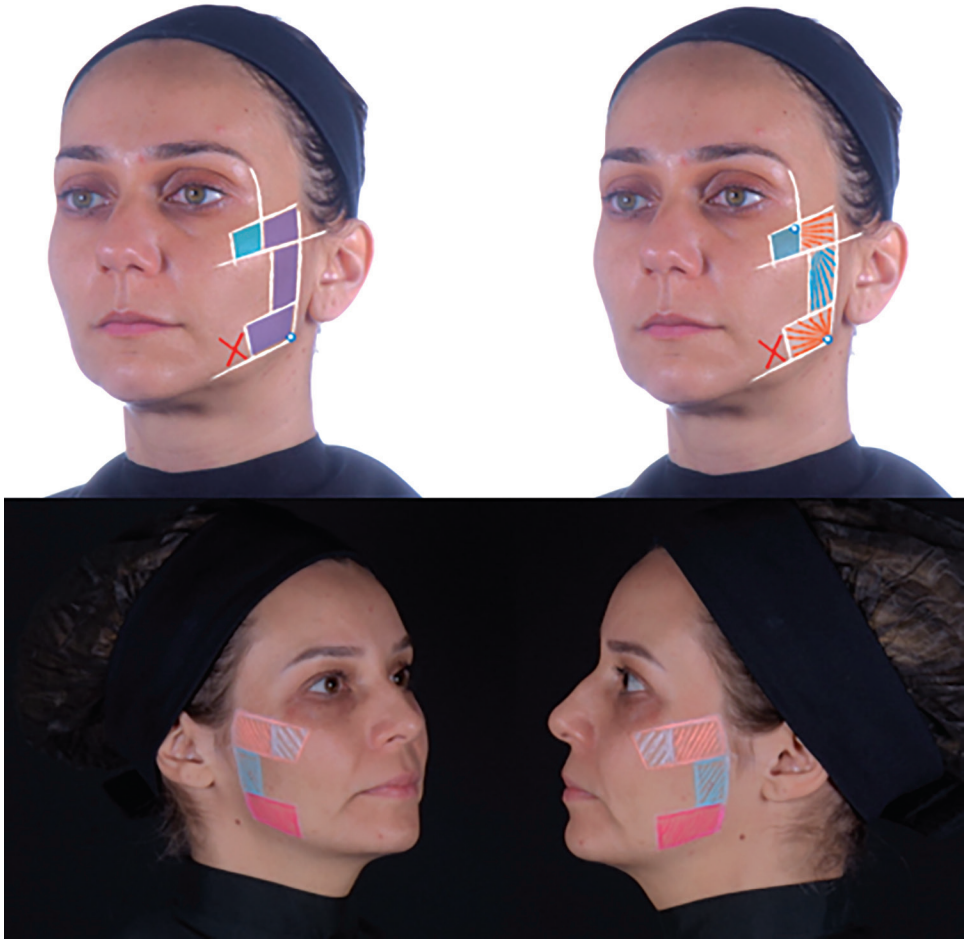


Fig. 1: Visualization scheme and bilateral planning of the regions of HArmonyCa™ injection: gonial, preauricular, and lateral zygomatic angles

measurement of dermal thickness. This will be achieved through the description of a clinical case before, immediately post-application, and after 4 months.

Technique

A patient indicated for OFH procedures through volumizing and biostimulating material applications was invited to participate in the study, having signed a specific informed consent form that authorizes the disclosure of the case and images. The procedure was performed on June 20, 2022, by applying HArmonyCa™ (Allergan Aesthetics, Irvine, CA, USA) in the gonial, preauricular, and bilateral lateral zygomatic angle regions (Fig. 1). On that occasion, the first evaluations were made with USG images in the recommended sites for product application.

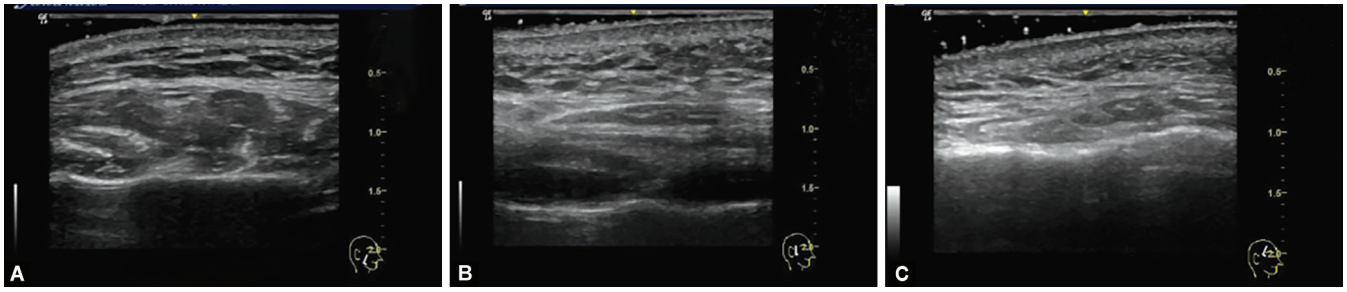
Thus, the US images obtained before and immediately after applying HArmonyCa™ were analyzed on each side of the face. The analyses occurred in a Logiq e® high-frequency US device (GE Healthcare, Chicago, IL, USA) with a probe/linear transducer of 18 MHz. The scans were performed in B mode, in the transverse/axial plane of the evaluated regions, and at depths between 1.5 and 2.0 cm. After 122 days (4 months) of the procedure and the first image acquisition, the same professional performed a second evaluation, following the same initial acquisition pattern. The thickness of the superficial dermis and hypodermis complex was measured on predetermined sites of these scans.

A radiologist indicated the equipment and transducer, leaving it to the professional's discretion and expertise to choose the most suitable products. The same evaluating radiologist experienced in facial USG performed all assessments. The measurements were made according to the areas of greater distance in the assessed images, and there may be variations depending on the exact focal point of analysis among pictures in the same region.

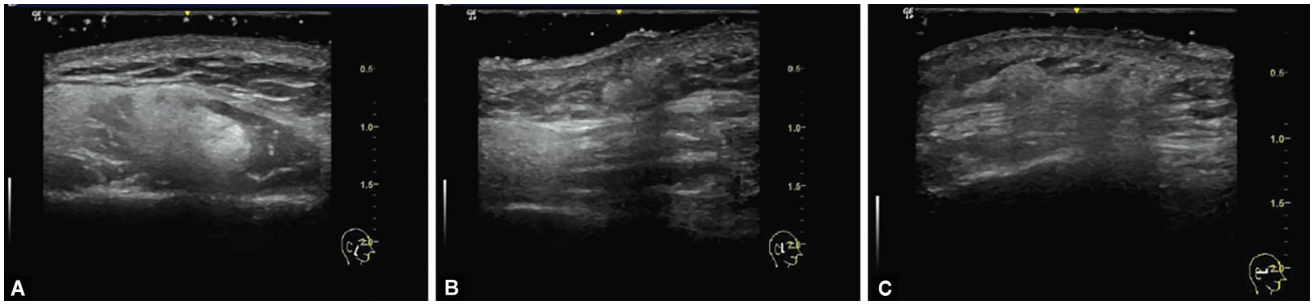
The initial preprocedure evaluation showed normal-looking anatomical structures without esthetic material in the analyzed areas (Fig. 2).

On the same day, the regions evaluated immediately after the procedure presented semi-permanent esthetic fillers as dispersed lobulated hyperechogenic areas with a cloud aspect. Such a condition occurred in the hypodermis of the right and left sides of the gonial angle (Fig. 3A), the superficial hypodermis of the right and deep left sides of the preauricular area (Fig. 3B), and the superficial hypodermis of the right and left sides of the zygomatic region (Fig. 3C), compatible with the hyaluronic acid and calcium hydroxyapatite microspheres from HArmonyCa™. Visually, without measurements, there was an evident immediate increase in the volume of areas assessed by lifting the superficial skin compared with the respective preprocedure images (Fig. 4).

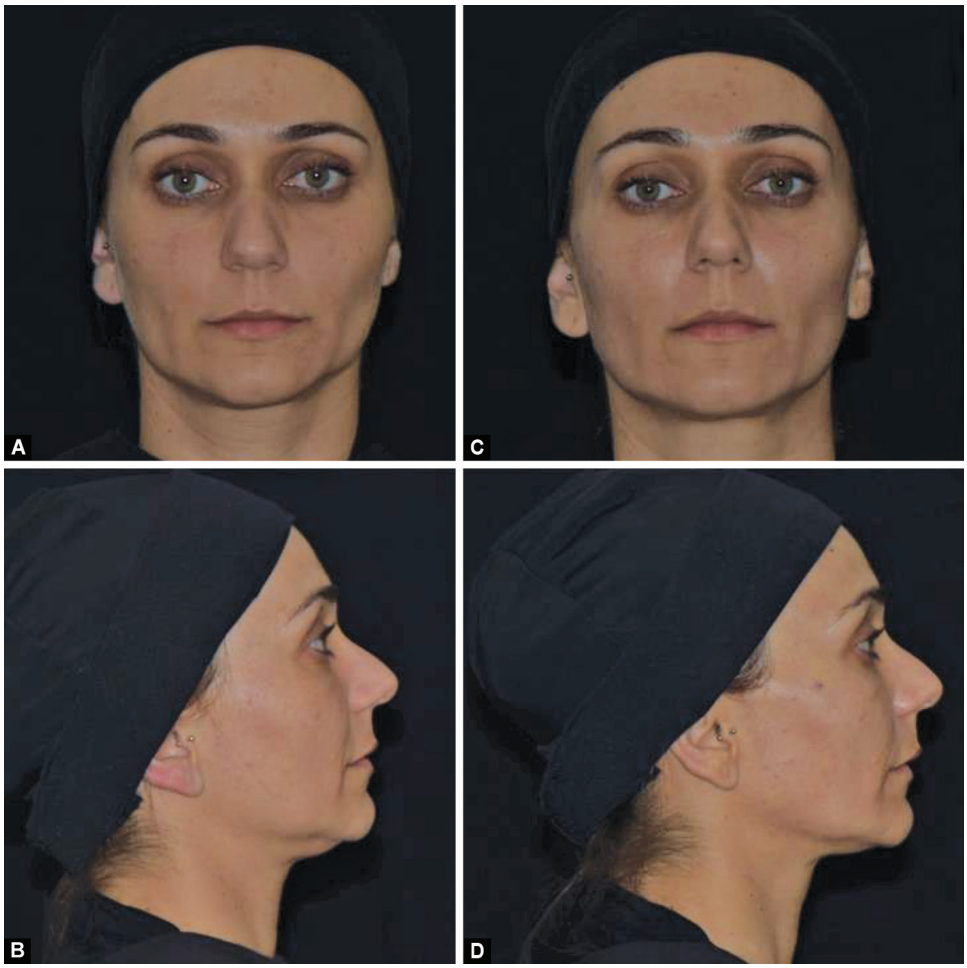
On October 19, 2022, 122 days (4 months) after the first evaluations, dispersed lobulated hyperechogenic areas with a cloud aspect appeared in the deep hypodermis of the right and left



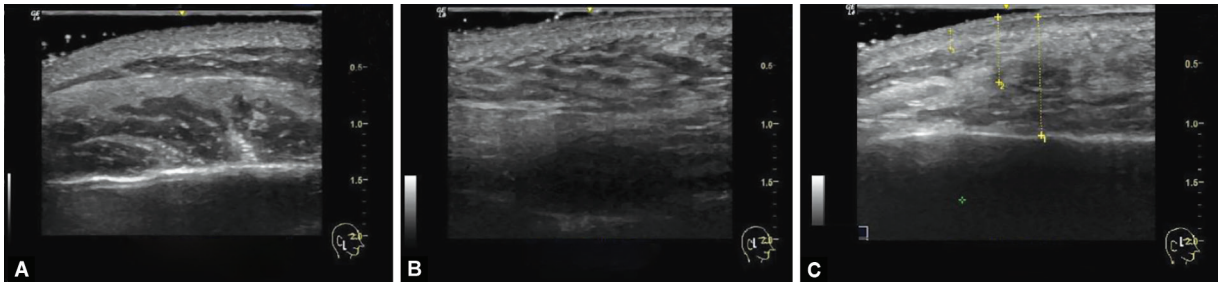
Figs 2A to C: (A) Preprocedure US image of the gonial angle on the right side; (B) Preprocedure US image of the preauricular region on the right side; (C) Preprocedure US image of the zygomatic area on the right side



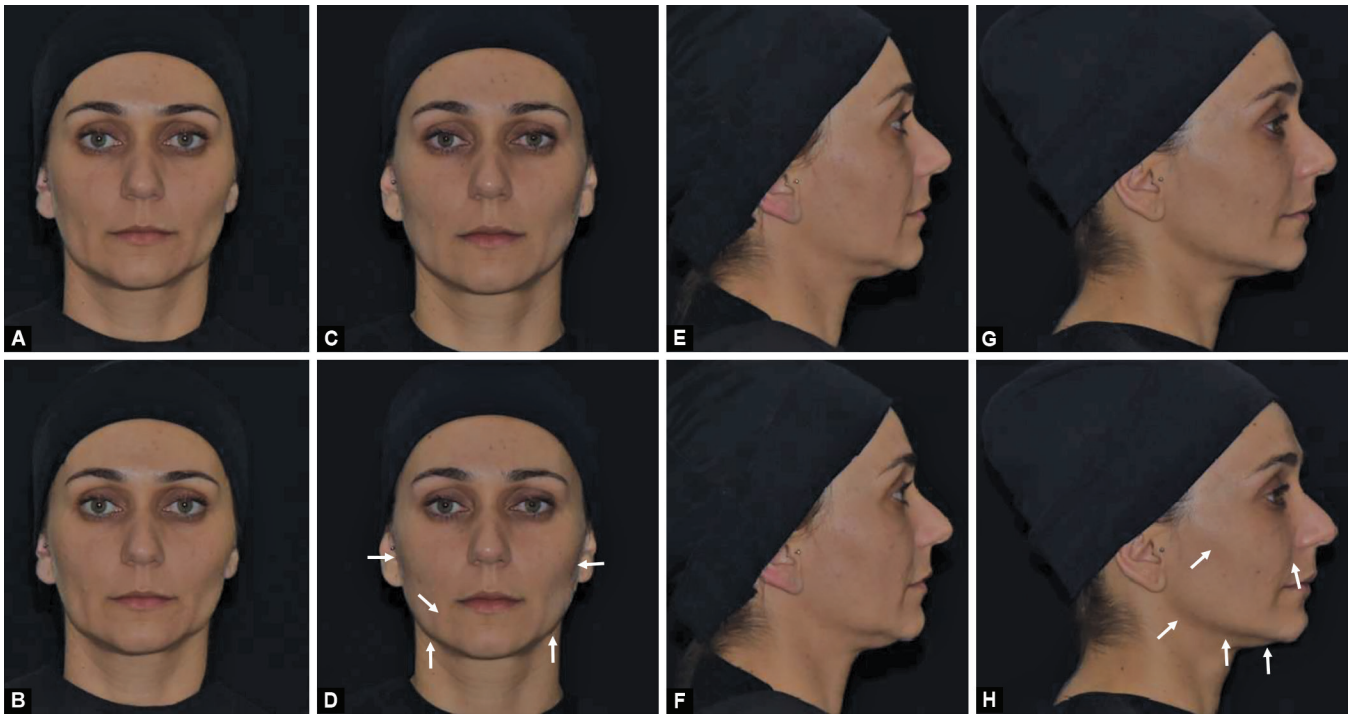
Figs 3A to C: (A) Immediate post-procedure US image of the gonial angle on the right side; (B) Immediate post-procedure US image of the preauricular region on the right side; (C) Immediate post-procedure US image of the zygomatic area on the right side



Figs 4A to D: (A and B) Clinical images demonstrating the previous appearance; (C and D) Clinical images demonstrating the post-immediate appearance after HArmonyCa™ filling



Figs 5A to C: (A) Ultrasound image of the gonial angle on the right side 4 months after the procedure; (B) Ultrasound image of the preauricular region on the right side 4 months after the procedure; (C) Ultrasound image of the zygomatic area on the right side four months after the procedure



Figs 6A to H: (A, C, E, G) Clinical images demonstrating the previous appearance; (B, D, F, H) Clinical images of the 30-day follow-up visit after HArmonyCa™ filling; (D and H) Arrows indicating volume changes and tissue repositioning after treatment

sides of the gonial angle (Fig. 5A), the superficial hypodermis of the right and deep left sides of the preauricular area (Fig. 5B), and the superficial hypodermis of the right and left sides of the zygomatic region (Fig. 5C), compatible with the hyaluronic acid and calcium hydroxyapatite microspheres from HArmonyCa™.

The images obtained on the first and second assessments (Fig. 6), which took measurements from the cortical bone to the superficial skin/epidermis, from the superficial hypodermis to the superficial skin/epidermis, and of dermal thickness, showed changes in superficial hypodermis volume and increased dermal thickness of the right and left gonial angle. The preauricular area presented changes in bilateral superficial hypodermis volume and increased dermal thickness, the latter only on the right side, while the left side measurement remained the same. The right and left sides of the zygomatic region demonstrated increased superficial hypodermis volume and dermal thickness. All these anatomical sites also evidenced increased dermis echogenicity compared with preprocedure images, suggesting a biostimulating action of the product on the dermis.

Discussion

Ultrasound is a recent diagnostic method. In medicine, its use started gaining momentum in the 1970s, and in the following decades, US became widely accepted in several medical specialties. Skin evaluation has always been limited by the need for transducers with higher frequencies, unavailable in commercial devices until recently.[2,5] In dermatology, high-frequency US has allowed the effective control of dermal filler location and skin deposit volume, which may improve the quality[2] and safety of facial esthetic procedures, as it helps detect and identify the type of filler and other anatomical information that can enhance the cosmetic prognosis.[1]

Using US images in the present study allowed the verification of semi-permanent esthetic fillers in the superficial hypodermis and changes in dermal thickness in all facial regions that received HArmonyCa™. However, it is worth noting that the preauricular area presented more dermal thickness alterations only on the right side, and the left side measurement remained the same as the

first evaluation. This discrepancy may have occurred because the US examination is operator-dependent and has been performed without precisely standardizing measurement times.

Thus, if US is established as an auxiliary noninvasive method of internal tissue analysis in treatment outcomes with HArmonyCa™, also aiming at its legal value and proof of results, it cannot guarantee the delivery of US analyses performed by different radiologists in one same patient and/or different ones. Ultrasound investigations must be as standardized as possible, performed by the same radiologist, with the same device and examination technique or depth and image adjustments in the same regions, and with precision between acquisition times.

Conclusion

High-frequency US proved effective in the static evaluation of HArmonyCa™ behavior on the facial skin at application sites, as well as in assessing volume gain and facial skin improvement through quantitative measurement of dermal thickness 122 days after product application. These findings are consistent with the clinical observations described.

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