

CLINICAL COMMENTARY

Where and when to use ultrasonography in botulinum neurotoxin, fillers, and threading procedures?

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Dear Editor,

The efficiency of using ultrasonography in clinical settings is a subject of controversy with pros and cons. The utilization of ultrasonography for cosmetic purposes on the face is a relatively recent advancement. Ultrasonography offers patients a sense of security during skin rejuvenation procedures, aiding practitioners in identifying blood vessels, nerves, and layers. However, a fundamental understanding of facial anatomical structure is essential, as ultrasonography presents these structures in two dimensions, potentially leading to difficulties.

Ultrasonography frequencies typically range from 10MHz to 15MHz when applied to the face. Frequencies lower than this range are suitable for visualizing deeper layers, making it challenging to focus on facial depth, while higher frequencies are used for observing skin layers.

Effective utilization of ultrasound begins with the identification of key reference points. For instance, recognizing structures like procerus for the upper face, LLSAN for the mid-face, and DAO for the lower face facilitates comprehension of surrounding structures (Figure 1).¹

Doppler functionality aids in locating blood vessels, helping differentiate between veins and arteries. Unlike body ultrasound, pressure is not applied during facial observation due to the small and surface-level anatomical structures. However, excessive gel application is necessary to enhance visibility, which presents a drawback.

Over-application of gel; however, leads to the formation of air bubbles causing posterior acoustic shadowing, rendering anatomical structure observation difficult. Moreover, excessive gel application hinders ultrasonography-guided procedures. Challenges include

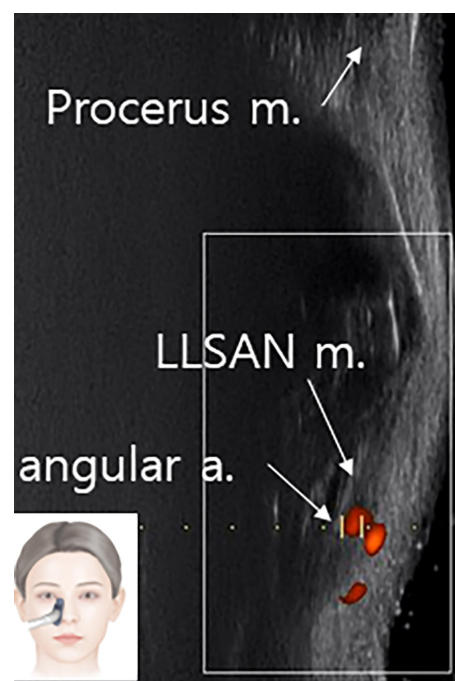


FIGURE 1 Key muscles of LLSAN observed by ultrasonography for assessment of the anatomical structures.

using aseptic gel, cost inefficiency, difficulty in maneuvering, and the requirement for additional personnel to stabilize the probe.

Ultrasonography is primarily employed for pre and post-assessment in procedures like thread lifting. Real-time observation

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helps identify misplaced threads early, preventing complications. Ultrasonography assists in cases of thread-related complications like dimpling or humps. It accurately locates the exact position of the threads for prompt correction. The thread is accidentally placed in the parotid gland during lateral facial lifting. If this occurs, we are likely to diagnose parotitis using ultrasonography (Figure 2).^{2,3}

During procedures involving fillers, simultaneous ultrasound application aids in reducing vascular complications and alleviating patient concerns (Figure 3A). Understanding individual vascular patterns guides safe injection practices. The variation in the pathways of blood vessels among individuals necessitates a procedural understanding of these pathways. In cases where vessels are thicker or anastomosis is prevalent, ultrasonography-guided injections are employed. Ultrasonography is commonly utilized when dealing with long past injected fillers, especially high viscosity ones that have been injected in boluses. These fillers can become encapsulated by



FIGURE 2 Ultrasonographic observation of the thread inserted (yellow arrow) into the parotid gland with fluid collection (red dotted circle). If the thread insertion had been guided by ultrasonography, these complications might have been reduced. Additionally, ultrasonography can be used for diagnostic purposes in cases of parotitis after thread insertion.

non-inflammatory cells which we call non-inflammatory granuloma, leading to long-lasting effects (Figure 4).^{4,5}

The presence of fillers in the mobile areas around structures complicates the task of achieving precise targeting and dissolution. Despite assertions of successful filler dissolution, situations in which fillers persist without being dissolved are quite common. Furthermore, encounters with patients allergic to hyaluronidase are frequent occurrences. In such cases, it becomes imperative to administer minimal doses of hyaluronidase. Through the judicious

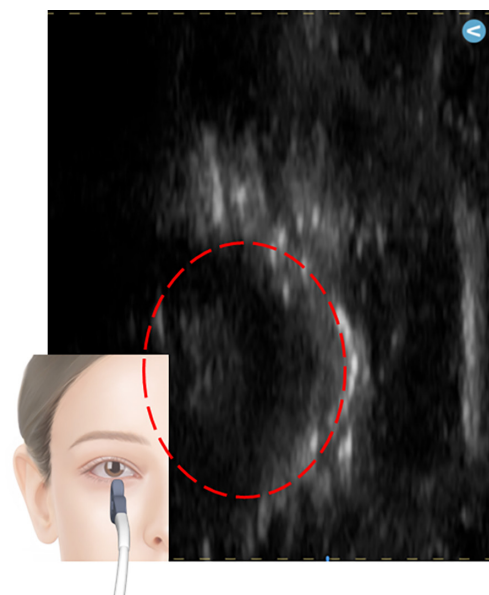


FIGURE 4 Ultrasonographic observation of inactive granuloma (red dotted circle) located superficial the orbital rim. The inactive granulomas make it difficult to dissolve hyaluronic acid because they are covered and encapsulated.

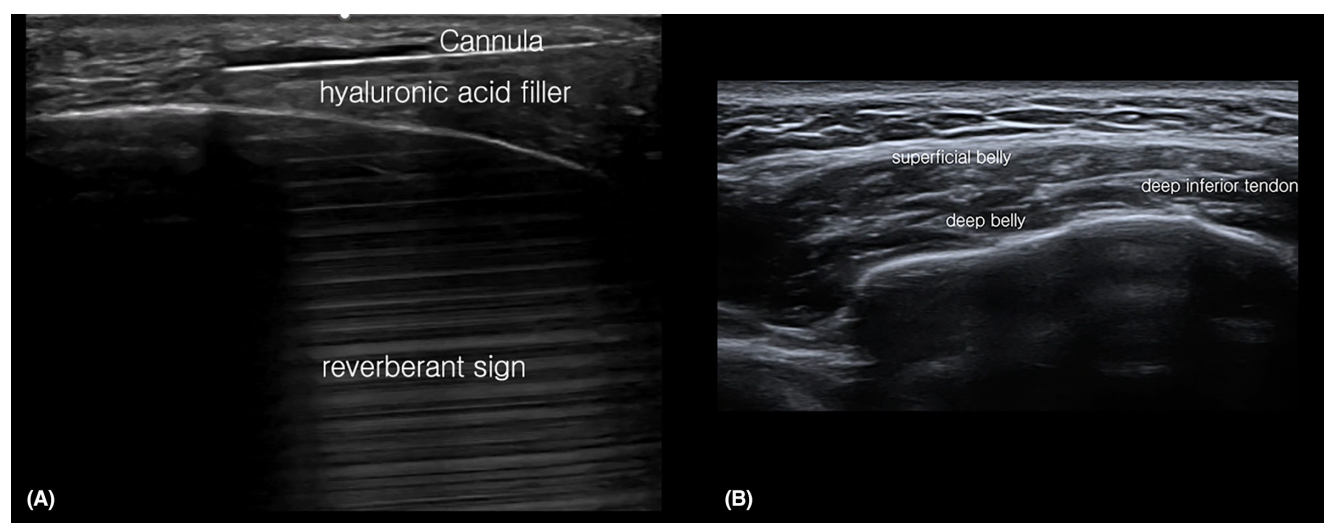
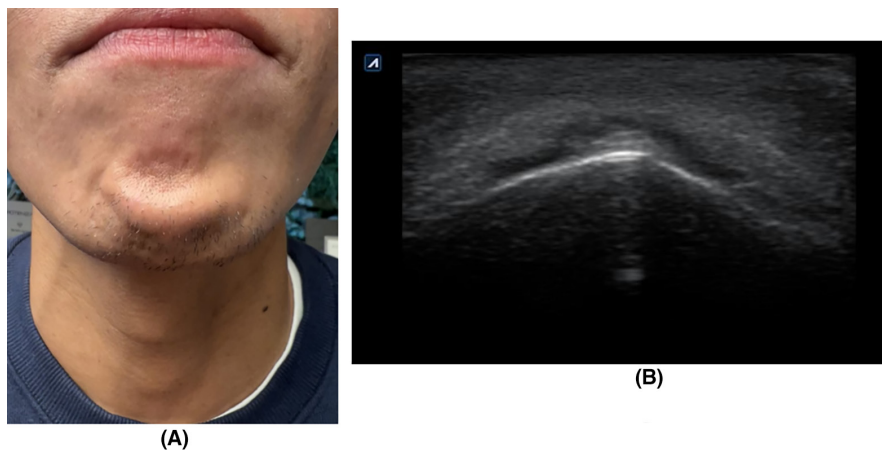


FIGURE 3 Ultrasonography guided hyaluronic acid filler injection on forehead. Anechoic component are the injected fillers. Reverberant signs of the cannula can be observed and the hyaluronic acid being injected retrogradely from the cannula tip (A). The filler used is number 6. Lorient, Joonghun Pharm., Republic of Korea When filler is injected retrograde filling is made. Observation of the masseter muscle to identify the deep inferior tendon to make sure dual plane of botulinum neurotoxin injection is possible (B).

FIGURE 5 A patient with paradoxical mentalis bulging (A) and corresponding ultrasonographic observation (B). This occurs when the superficial part of the mentalis is affected by botulinum neurotoxin injection.



use of small quantities and the integration of ultrasound, it becomes feasible to achieve accurate filler dissolution, thus averting potential subsequent side effects.⁶

Allergic reactions are a prevalent side effect associated with hyaluronidase use. Typically, these allergic reactions to hyaluronidase are localized, although systemic reactions may occur in rare instances. Given that most allergic responses to hyaluronidase manifest as immediate hypersensitivity reactions, it is advisable to inject the smallest possible amount.^{7,8} There exists an allergic reaction threshold, which represents the minimum amount capable of triggering an allergic response. Consequently, administering a minimal injection may not induce allergic reactions.⁹

In the case of botulinum neurotoxin, it can be employed to prevent paradoxical masseteric bulging.¹⁰ The presence of the deep inferior tendon within the masseter distinguishes the superficial and deep bellies (Figure 3B). Furthermore, in situations where paradoxical mentalis bulging occurs—often resulting from superficial injections or chin augmentation with fillers—an ultrasonography-guided botulinum neurotoxin injection can offer valuable assistance (Figure 5).

This tendon, characterized by its taut fascia, obstructs the spread of botulinum neurotoxin. By observing the masseter in ultrasound and dissolving the neurotoxin, effective reduction can be achieved.

When a patient does not respond to Botulinum neurotoxin treatment on the masseter, ultrasound observation can reveal fibrosis, indicating resistance to the neurotoxin. This often occurs due to the difficulty of effecting volume changes in cases of multiple injections. Employing ultrasound and injecting neurotoxin into unaffected areas can lead to further volume reduction.

Ultrasonography is also beneficial in preventing vessel damage, particularly in identifying sentinel veins, facial vessels, and anterior cervical veins. For example, in the case of the sentinel vein, injecting botulinum neurotoxin in lateral canthal rhytide and frontalis areas often leads to bleeding.¹¹ Furthermore, the use of ultrasound is advantageous when reducing the volume of the submandibular gland, as its varied location and size can be challenging to palpate. The presence of the anterior cervical vein and facial vessels in proximity to the submandibular gland makes ultrasound a valuable tool.

In summary, incorporating ultrasound into thread, filler, and botulinum neurotoxin procedures not only provides guidance to practitioners but also offers a treatment option that aligns with the future needs and satisfaction of both patients and practitioners.

AUTHOR CONTRIBUTIONS

Kyu-Ho Yi have reviewed and approved the article for submission. Kyu-Ho Yi: Conceptualization; Writing—Original Draft Preparation, Review and Editing; Visualization; Supervision.

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This study was conducted in compliance with the Declaration of Helsinki.

CONFLICT OF INTEREST STATEMENT

I acknowledge that I have considered the conflict of interest statement included in the "Author Guidelines." I hereby certify that, to the best of my knowledge, that no aspect of my current personal or professional situation might reasonably be expected to significantly affect my views on the subject I am presenting.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

ETHICS STATEMENT

This article does not contain any studies with human participants or animals performed by any of the authors.

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