US Applications in Filler Injection Procedures

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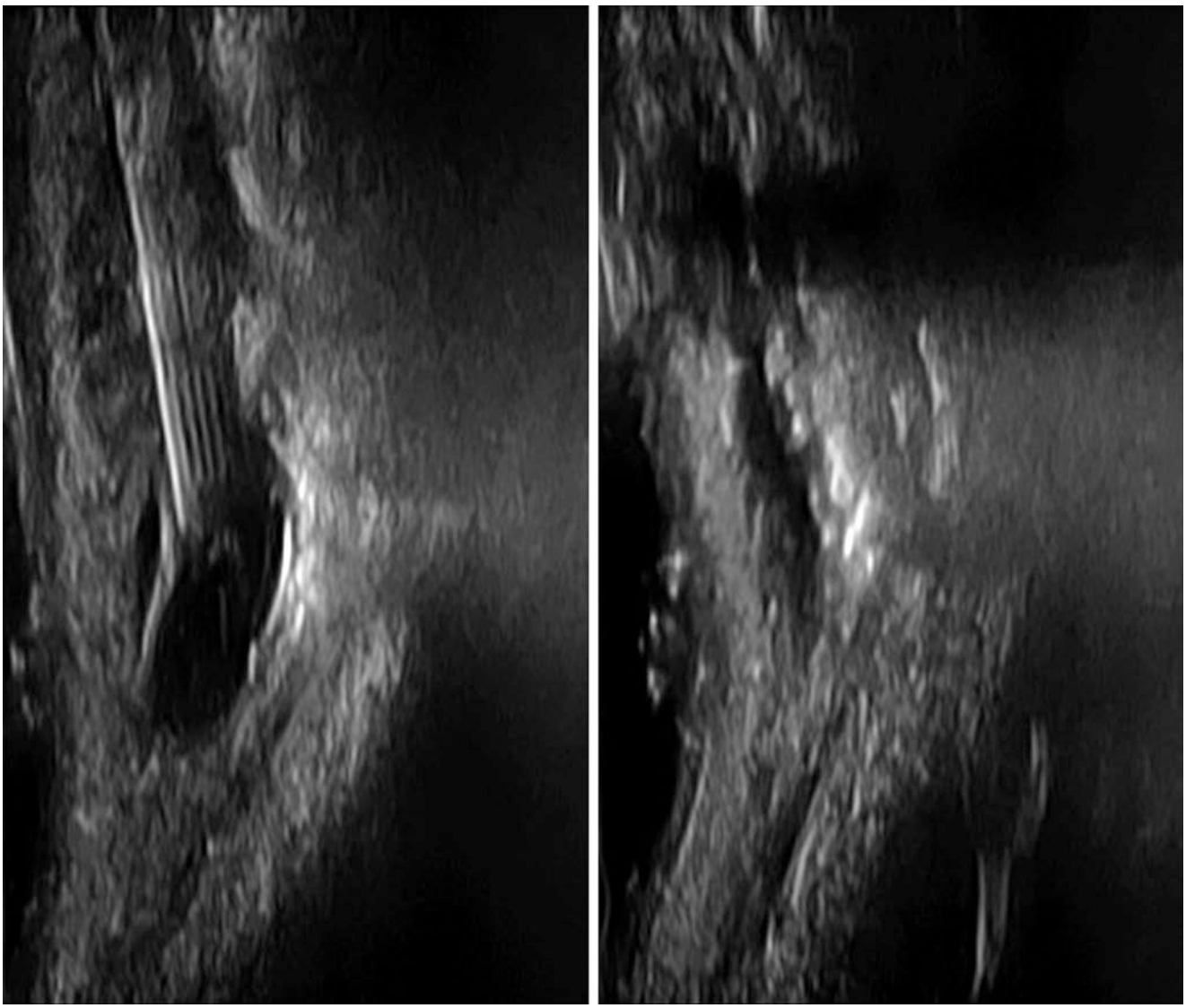

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9.1 Backgrounds of the US-Guided Filler Injections

Since treatment indications for fillers have developed beyond past extent, a broader comprehension regarding the facial anatomy is required. Complications such as skin necrosis, blindness, and embolism can be detrimental, thus leaving practitioners wondering for a novel method that can reduce vessel-related complications. Incessant research on the vessel anatomy and distribution has been thoroughly executed, leading to fewer complications. Still, distinguishing every variation in each individual is impossible, and there will always be a limitation with blind injection. Implementing US imaging with fillers will be a revolutionary introduction to the field.

Doppler mode imaging has the advantage that allows the identification of the vessels for filler injection. Since intravascular injection of fillers can have devastating results, inspection of the vessel of each individual is necessary since vascular anatomy is varied and not one standard guideline can be used. Using US Doppler mode allows the practitioner to inspect the vessels in real time, thereby lowering the complication rates. Another advantage is that it allows the visualization of the layers below the skin. Practitioners previously defined the layers as either "deep" or "superficial" for the blind technique. However, this technique relies on tactile sensation, which is not reliable and cannot duplicate the same depth every time. The other advantage is that the location of the filler can be precisely detected and removed under US guidance. US imaging can not only locate the filler but it can also evaluate its migration, compartment formation, and granulomatous pathology. Once confirmed, US allows minimal amounts of hyaluronidase to be exactly injected into the area of interest, which is more effective than a blind technique that requires larger amounts of injection.

However, US imaging can have the disadvantage of a difficult interpretation. Unlike the body, in the face, the thin muscles and fat are entangled, and the density and thickness of muscle and fat vary making the image hypoehoic, irregular, and difficult to define. Surgical procedures generally distort the normal anatomy. Vessel images using the US Doppler scanning may exhibit false-negative images, which may rely on the US resolution or be user-dependent. Another downfall is that US cannot discover very small vessels. Regardless, the advantages of using US outweigh the risk of adverse complications using the blind technique. Therefore, we must acquaint ourselves with US imaging.

US-guided filler injections require proficiency. They can be practical in largely two clinical situations. One is when the clinicians need to inject into a precise layer, and the other is when they need to avoid vessels. Excluding treatment areas with fatal complications, US imaging should be evaluated before injection.

Using hyaluronidase injections for filler removal is considerably helpful. US imaging can be utilized to locate the filler and precisely inject the hyaluronidase. Volume reduction can be seen through real-time US imaging, resulting in less amounts of hyaluronidase used. Compare to blind injections, US-guided injections dissolves more filler after filler manipulation.

The US-guided filler removal demands detailed scanning of the area to accurately approach the filler injection site. The needle should be positioned in the filler while slowly injecting the hyaluronidase, checking that the hyaluronidase volume expands and disrupts the filler. A sufficient volume of hyaluronidase is necessary to expose all areas of the filler to the hyaluronidase. In such procedures, 23–27 gauge needles, 1–2 in. long, are usually suggested. Needles smaller than 27 gauge may not disrupt all the filler material depending on the filler cohesiveness and gel hardness; meanwhile, needles larger than 23 gauge may cause vascular injury, leading to bruising. Ultimately, selection of the needle size must take the filler shape, rheology, and extent of complications into consideration.

9.2 US-Guided Filler Injection Procedures

9.2.1 Forehead and Glabella

The forehead and glabella are one of the most common areas for filler injection with the purpose of wrinkle improvement and volume augmentation. The loose connective tissue layer above the periosteum is recommended for filler injection. For the glabella, injection into the dermal or subdermal layer or supraperiosteal layer is advised to alleviate volume depletion and glabella frown lines. A forehead augmentation case shows the hyaluronic acid (HA) filler located above the periosteum (Fig. 9.1).

Depending on the property and injection technique of the filler, and since filler injection is widely distributed in this area, it can create compartments. Fillers may also convert into a rigid granulomatous lesion revealing hypoechoic US images (Fig. 9.2). Elastography may be beneficial in comparing the stiffness between normal and adjacent tissue exhibiting a pathologic change.

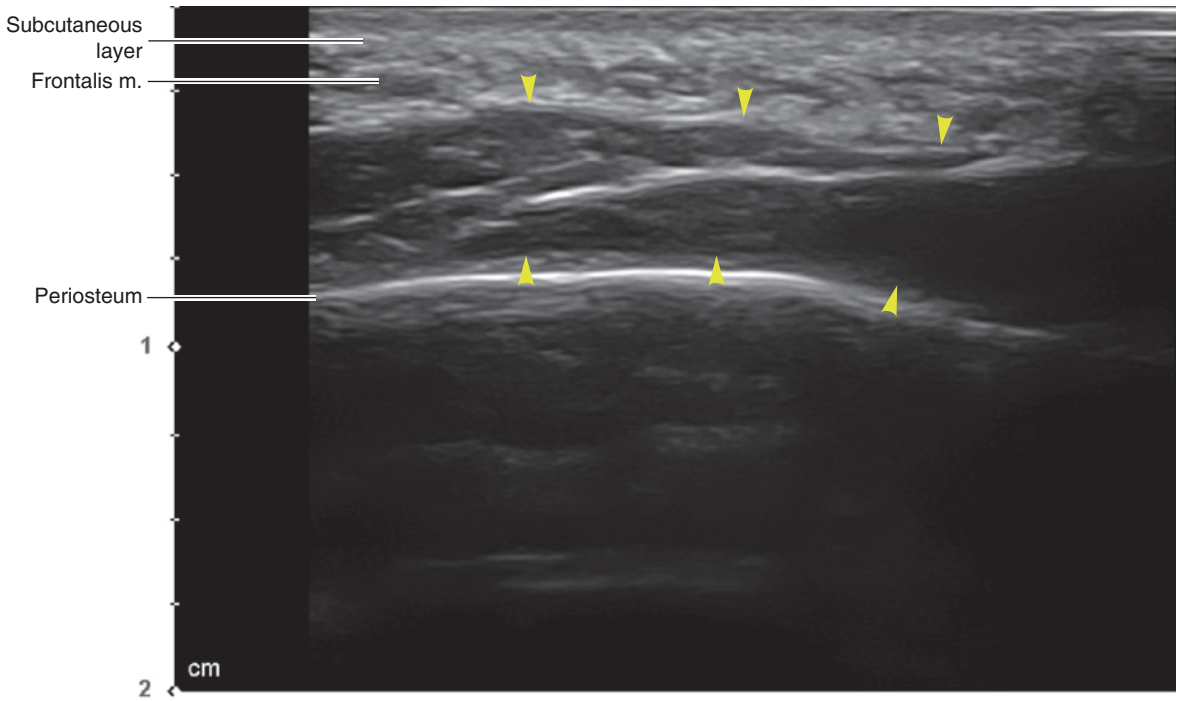

Fig. 9.1 Ultrasonography of the HA filler for the forehead augmentation, B mode (transverse view, 15 MHz by linear transducer) (yellow arrowheads: HA filler). (Published with kind permission of © Ji-Soo Kim 2020. All Rights Reserved)

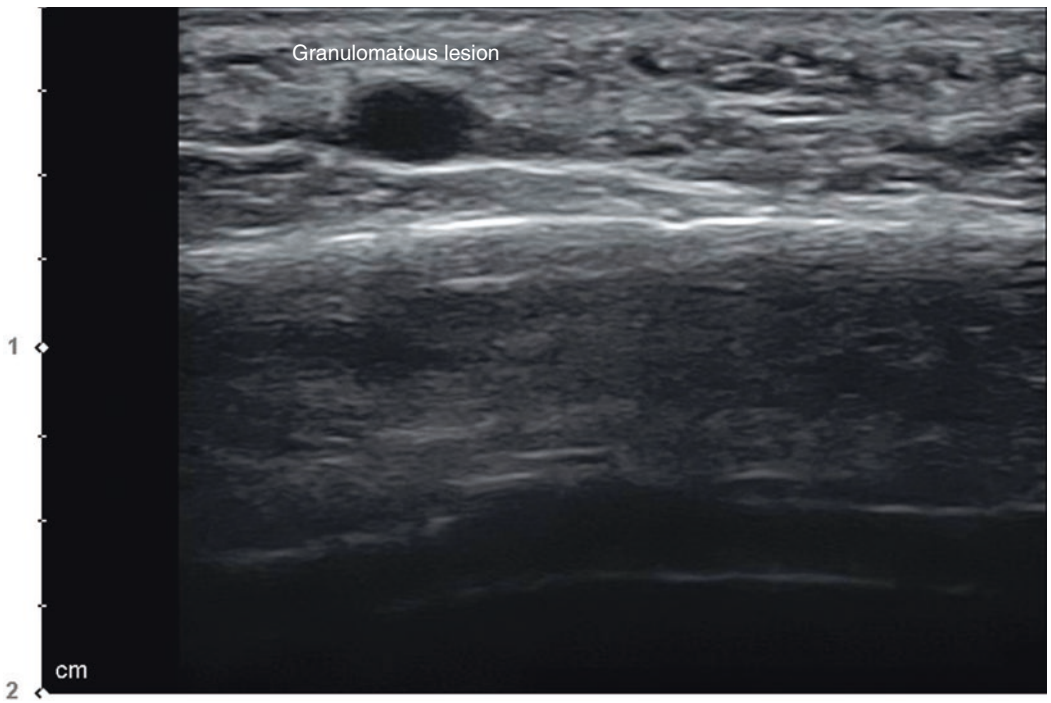

Fig. 9.2 Ultrasonography of the foreign body granuloma on the forehead after the filler injection, B mode (transverse view, 15 MHz by linear transducer). (Published with kind permission of © Ji-Soo Kim 2020. All Rights Reserved)

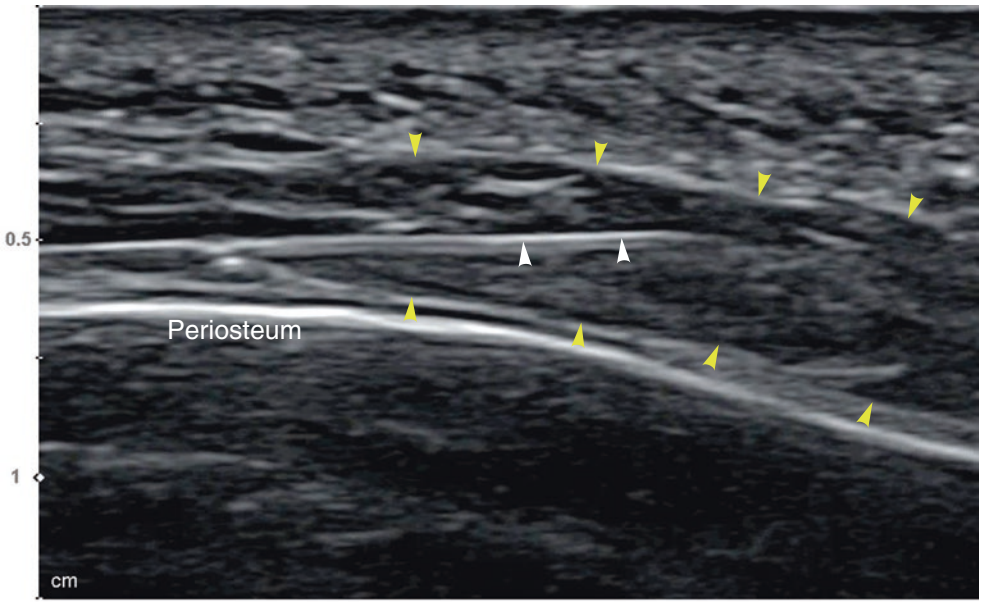

Fig. 9.3 Ultrasonography-guided filler removal on the forehead, B mode (transverse view, 15 MHz by linear transducer) (yellow arrowheads: HA filler, white arrowheads: injection needle). (Published with kind permission of © Ji-Soo Kim 2020. All Rights Reserved)

Through the Doppler image, the frontal branch of the superficial temporal a., which is lateral to the supraorbital a., should be identified and avoided during forehead augmentation procedures. Hence, the location of the supraorbital a. running within the loose connective tissue layer above the periosteum should be confirmed. At the entry point of the cannula, special concern on the exact location of the superficial temporal a. is recommended to prevent skin necrosis due to intra-arterial filler injection.

The glabella region is a highly risky area due to the presence of the supratrochlear a.; if the filler is injected intra-arterially, it could lead to skin necrosis and blindness. Vessel direction must be closely traced in the transverse and longitudinal US view modes. Recognizing the precise layer where the supratrochlear a. lies is essential since it is below the glabella wrinkles (Fig. 3.16).

When dissolving fillers in the forehead area, an in-plane approach is beneficial since this is an outspread area (Fig. 9.3). Because large amounts of the filler are usually used for forehead augmentation, a horizontal approach is recommended rather than multiple vertical injections for filler removal.

9.2.2 Temple

Fillers are injected between the lateral forehead and zygomatic arch to smoothen the curvature of the temple. In cases that younger patients who have less fat in the temple with more protruded zygoma, or aged patients who have fat atrophy in the temple, temple looks more depressed. Because thin subcutaneous fat can be seen in patients with temple depression, an excess amount of fillers in the subcutaneous layer can lead to skin irregularities. The superficial temporal a. is situated near the skin with increasing chances of vessel damage (Fig. 3.21). Injection into the temporal fat pad placed between the superficial and deep layer of the deep temporal fascia is advantageous in volumizing but carries the risk of middle temporal v. injury. Accurate injection into fat above the temporalis m. is difficult since the temporal extension of the buccal fat escalates the probability of filler migration into the lower face. Therefore, filler injection into the subSMAS fat layer or above the periosteum is desired (Fig. 9.4).

From the Doppler image, the deep temporal a. within the temporalis m. should be identified before the injection procedures (Figs. 3.23 and 3.24). The STF surrounds the superficial temporal a. (STA), which is simply observed with the Doppler image. The subSMAS fat layer usually lacks vessel distribution, being the target site for filler injection. Avoiding the STA is possible by penetrating the needle below the STF layer. A strong pinch of the soft tissue in the temple area will elevate the STF attached to the skin. The subSMAS fat layer can be easily reached by using a cannula to perforate through the skin. However, if the cannula proceeds from the zygomatic arch, it can invest into the temporal fat pad and injure the middle temporal v. and cannot advance into the upper part of the temple. Approaching from the lateral eyebrow rather than the zygomatic arch when inserting the cannula makes access to the subSMAS fat layer easier because the retro-orbicularis oculi fat (ROOF) is connected to the subSMAS fat layer (Fig. 3.22).

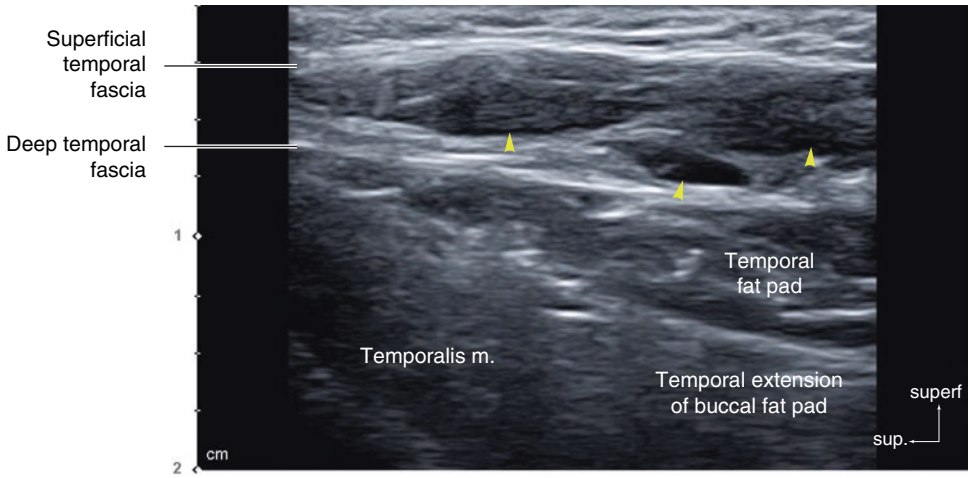

Fig. 9.4 Ultrasonography of the HA filler located between the superficial and deep temporal fascia, B mode (transverse view, 15 MHz by linear transducer) (yellow arrowheads: HA filler). (Published with kind permission of © Ji-Soo Kim 2020. All Rights Reserved)

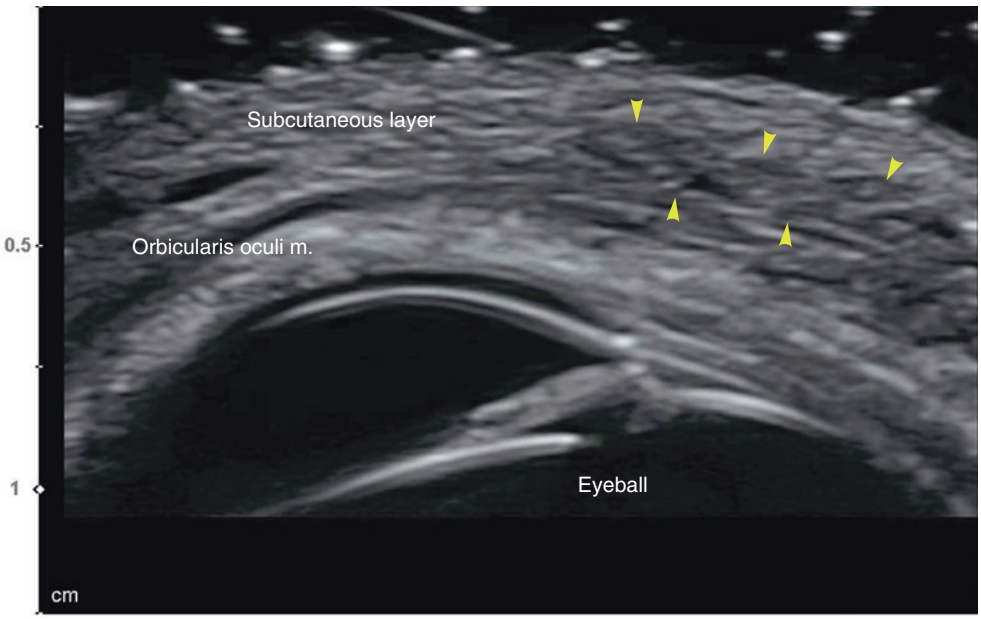

Fig. 9.5 Ultrasonography of the HA filler for the sunken eye augmentation, B mode (transverse view, 15 MHz by linear transducer) (yellow arrowheads: HA filler). (Published with kind permission of © Ji-Soo Kim 2020. All Rights Reserved)

9.2.3 Periorbital Area (Sunken Eye and Pretarsal Roll)

Generally, sunken eye enhancement requires filler injections in the subcutaneous fat layer or ROOF below the OOc m. layer (Figs. 4.13 and 4.14). The hypoechoic US image of the filler is identified in the subcutaneous layer (Fig. 9.5). For the enhancement of sunken eye appearance, injection into the subcutaneous layer will accompany irregularities unless the filler is very soft. The best injection plane is the ROOF, but the adjacent OOc m. is very thin and is approximated to the orbital septum making visualization on the US image difficult (Fig. 4.13). From the Doppler image, the supratrochlear a. passes the frontal notch toward the deep plane of the forehead, ultimately proceeding superficially (Fig. 4.11). This area coincides with the sunken eye, and a perpendicular periosteal approach must be avoided.

The target area for pretarsal roll augmentation is the subcutaneous layer superficial to the OOc m. Injections deeper to the OOc m. will compromise its shape while a superficial injection will cause the Tyndall effect. This is the hypoechoic US image of the filler lying just superficial to the OOc m. (Fig. 9.6). From the Doppler image, the vessels such as the inferior medial palpebral a. should be investigated since it runs within the pretarsal roll.

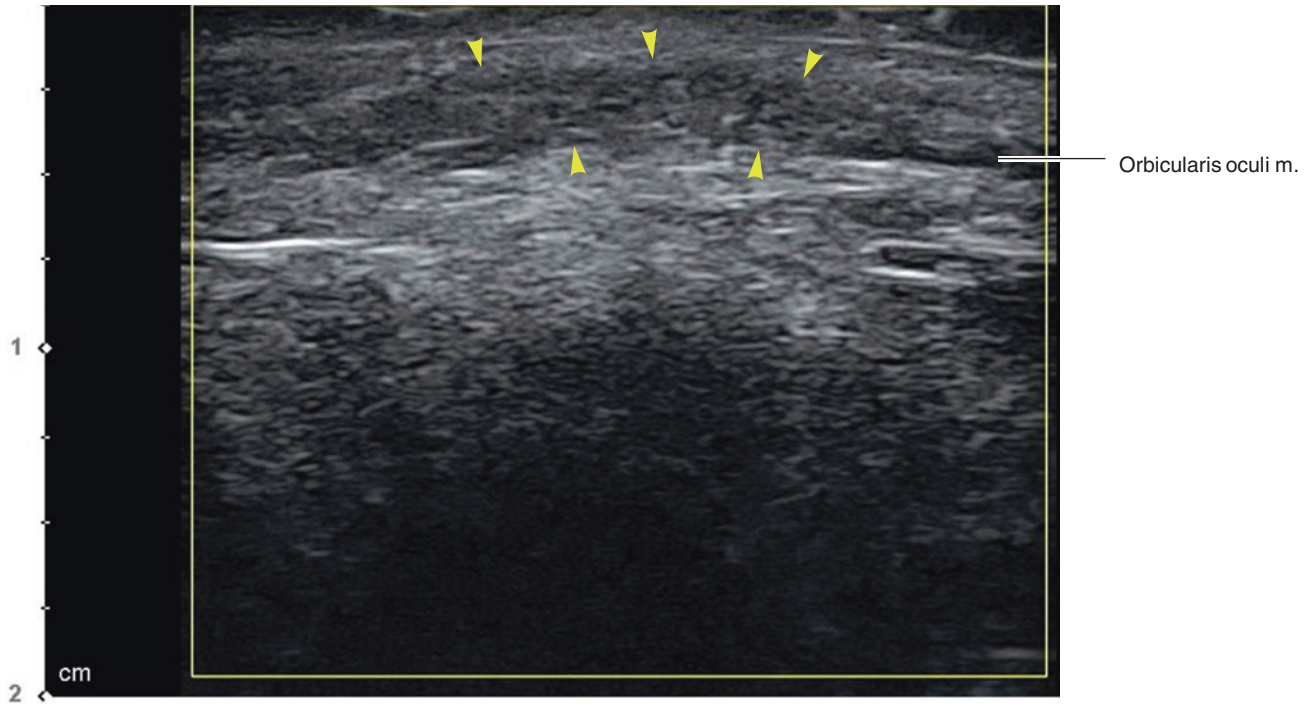

Fig. 9.6 Ultrasonography of the HA filler for the pretarsal roll augmentation, Doppler mode (transverse view, 15 MHz by linear transducer) (yellow arrowheads: HA filler). (Published with kind permission of © Ji-Soo Kim 2020. All Rights Reserved)

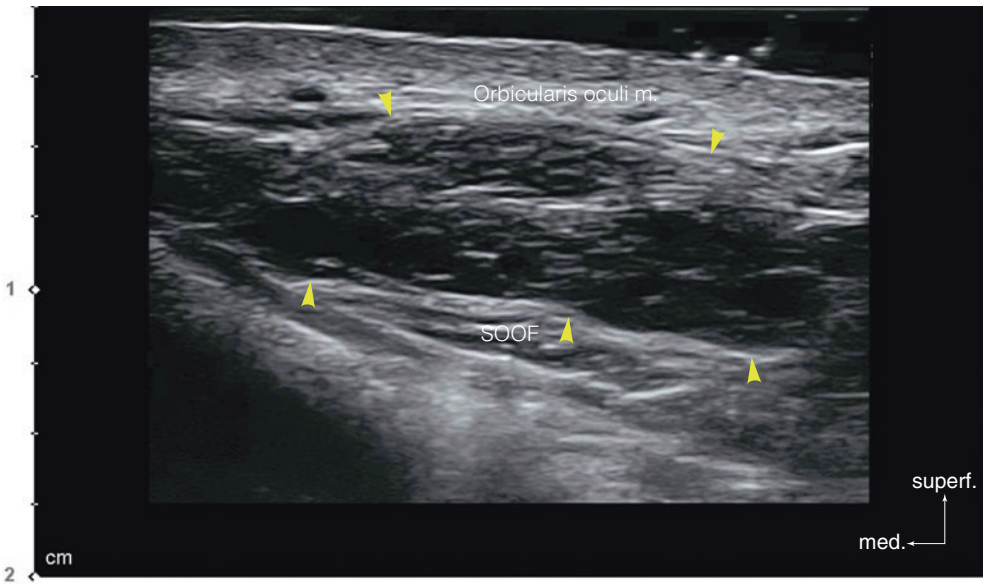

Fig. 9.7 Ultrasonography of the HA filler for the tear trough augmentation, B mode (transverse view, 15 MHz by linear transducer) (yellow arrowheads: HA filler). (Published with kind permission of © Ji-Soo Kim 2020. All Rights Reserved)

9.2.4 Tear Trough and Anterior Malar Augmentation

The ideal filler injection plane for tear trough correction is the thin subcutaneous layer or the sub orbicularis oculi fat (SOOF), which is deep to the OOc m. (Fig. 5.20). The US image shows the filler located below the OOc m. Hypoechoic filler material can be noticed medial to the tear trough above the periosteum of the inferior orbital margin. Hyperechoic filler material is also observed lateral to the tear trough in the upper layer of the SOOF (Fig. 9.7).

Enhancement of the tear trough requires a deep needle injection that pierces through the OOc m., advancing near the SOOF or prezygomatic space into the loose tissue. The cannula can comfortably approach this region or the subcutaneous layer, which is another option (Fig. 9.8). From the

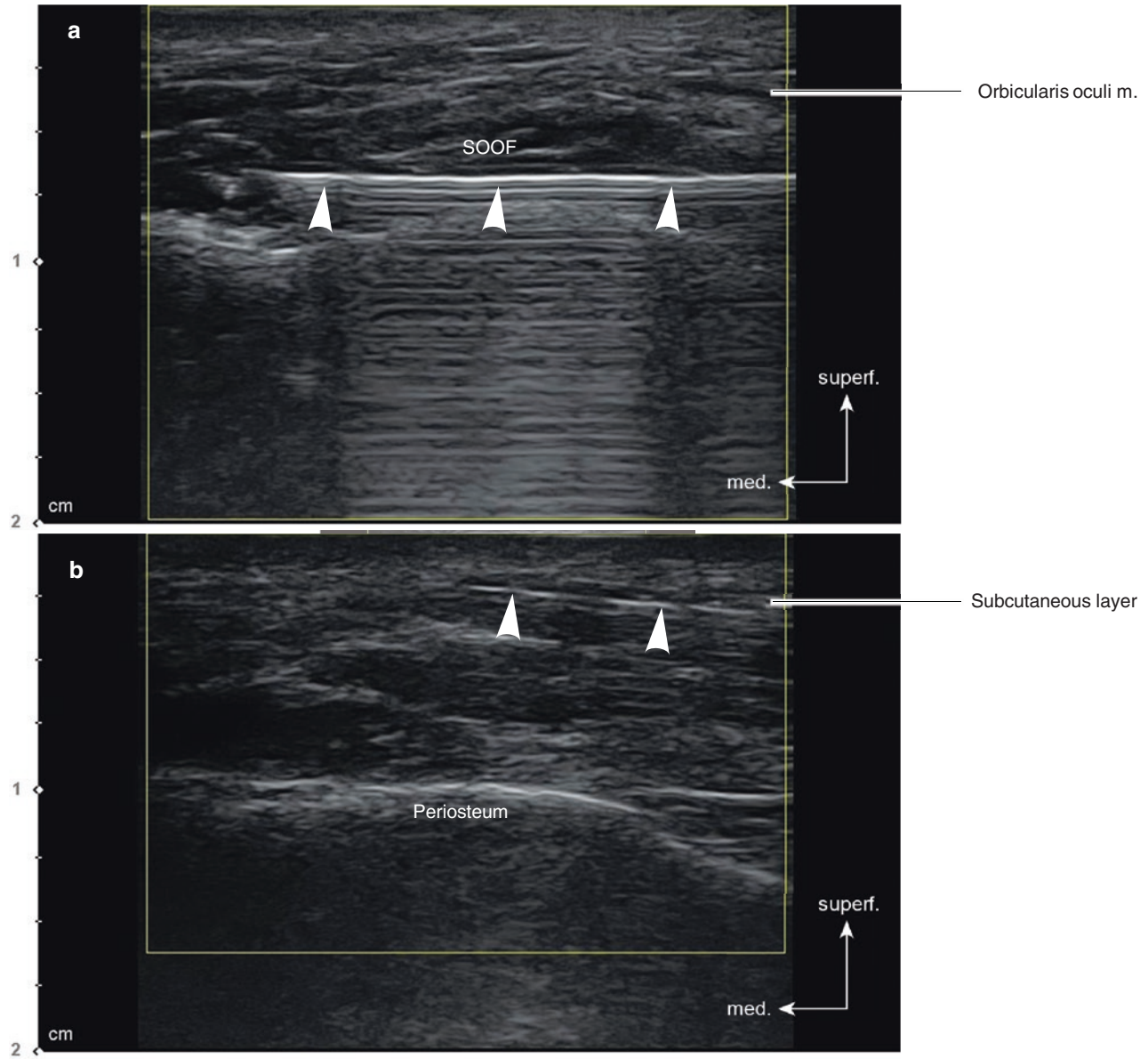

Fig. 9.8 Ultrasonography-guided HA filler injection for the tear trough augmentation. (**a**) Deep injection, B mode (transverse view, 15 MHz by linear transducer) and (**b**) superficial injection, B mode (transverse view, 15 MHz by linear transducer) (white arrowheads: injection needle). (Published with kind permission of © Ji-Soo Kim 2020. All Rights Reserved)

Doppler image, the angular and inferior palpebral aa. should be confirmed prior to injection (Figs. 4.16, 5.17, and 5.25). Subcutaneous plane injection should be implemented in select cases since fillers can cause irregularities and make the Tyndall effect.

The ideal injection plane for anterior malar augmentations is the SOOF, but the subcutaneous layer can also be addressed (Fig. 9.9). For the anterior malar augmentation procedure, the location of the infraorbital foramen must be pre-checked (Fig. 5.18). Cannula use is recommended. The cannula should slowly perforate the deep fat layer slightly above the LLS m.

Visualizing the superficial portion of the OOc m. is somewhat possible, but it is impossible to distinguish the deeper structure underneath the OOc m. Implementing US imaging to observe the hypoechoic image when removing the fillers are beneficial. Fillers injected for anterior malar augmentation should be monitored from both the superficial and deep layers. US-guided hyaluronidase injection can precisely engage into the filler and disrupt it (Figs. 9.10 and 9.11).

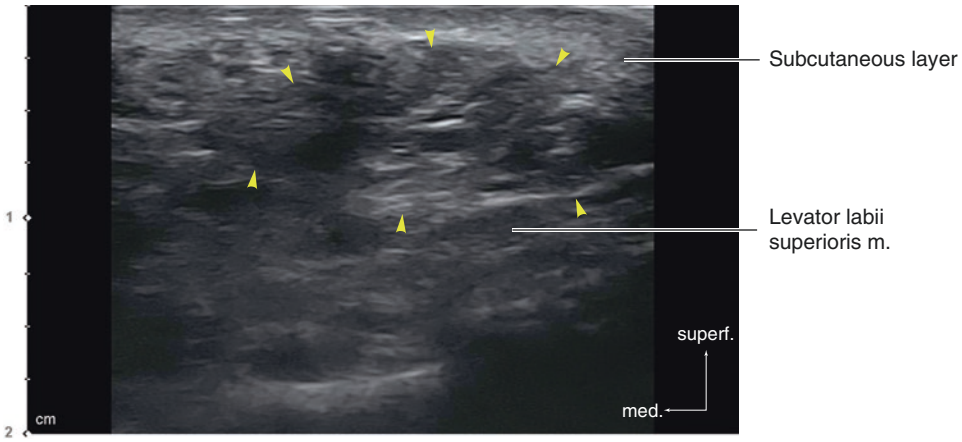

Fig. 9.9 Ultrasonography of the HA filler in the subcutaneous layer for the anterior malar augmentation, B mode (transverse view, 15 MHz by linear transducer) (yellow arrowheads: HA filler). (Published with kind permission of © Ji-Soo Kim 2020. All Rights Reserved)

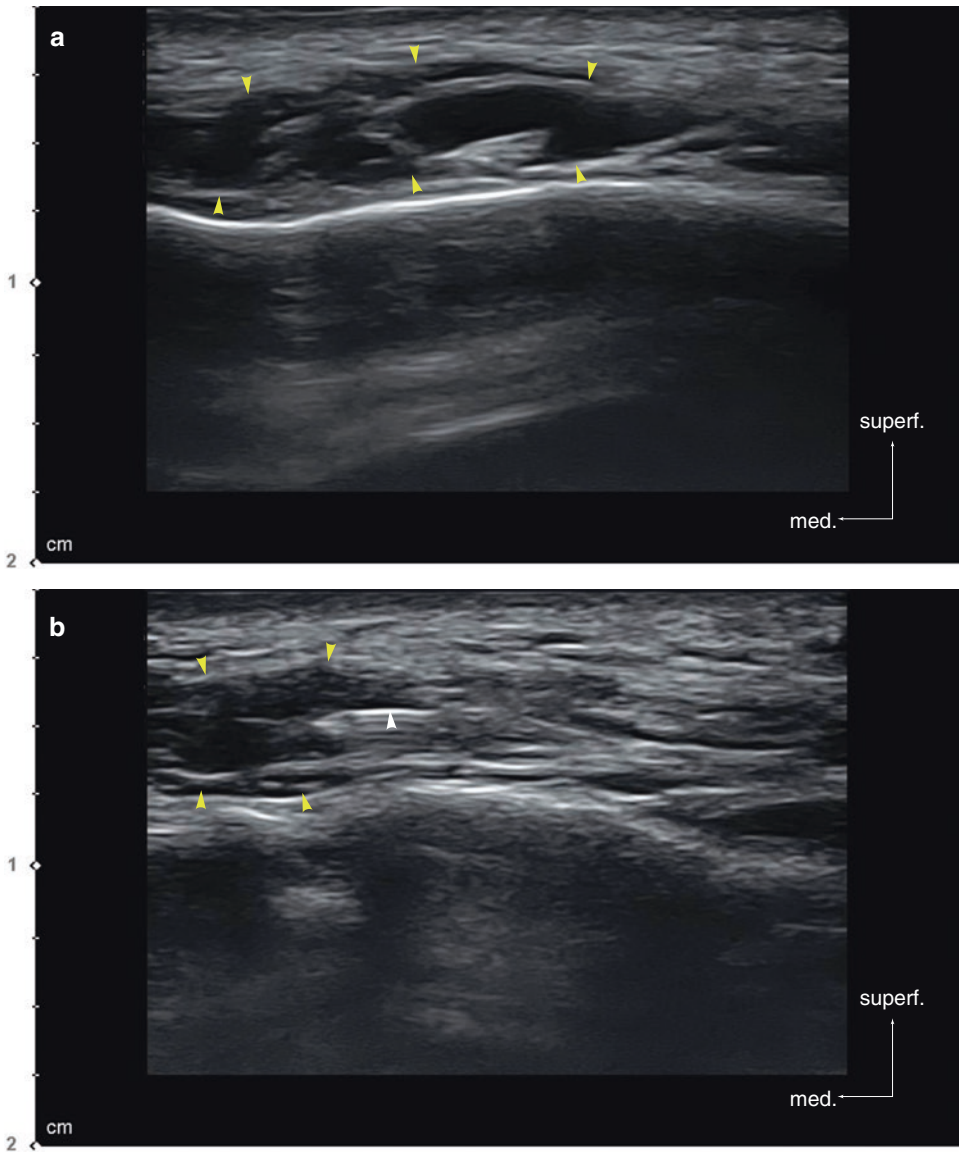

Fig. 9.10 Ultrasonography-guided filler removal on the tear trough region. (**a**) Before injection, B mode (transverse view, 15 MHz by linear transducer) and (**b**) during hyaluronidase injection, B mode (transverse view, 15 MHz by linear transducer) (yellow arrowheads: HA filler, white arrowhead: injection needle). (Published with kind permission of © Ji-Soo Kim 2020. All Rights Reserved)

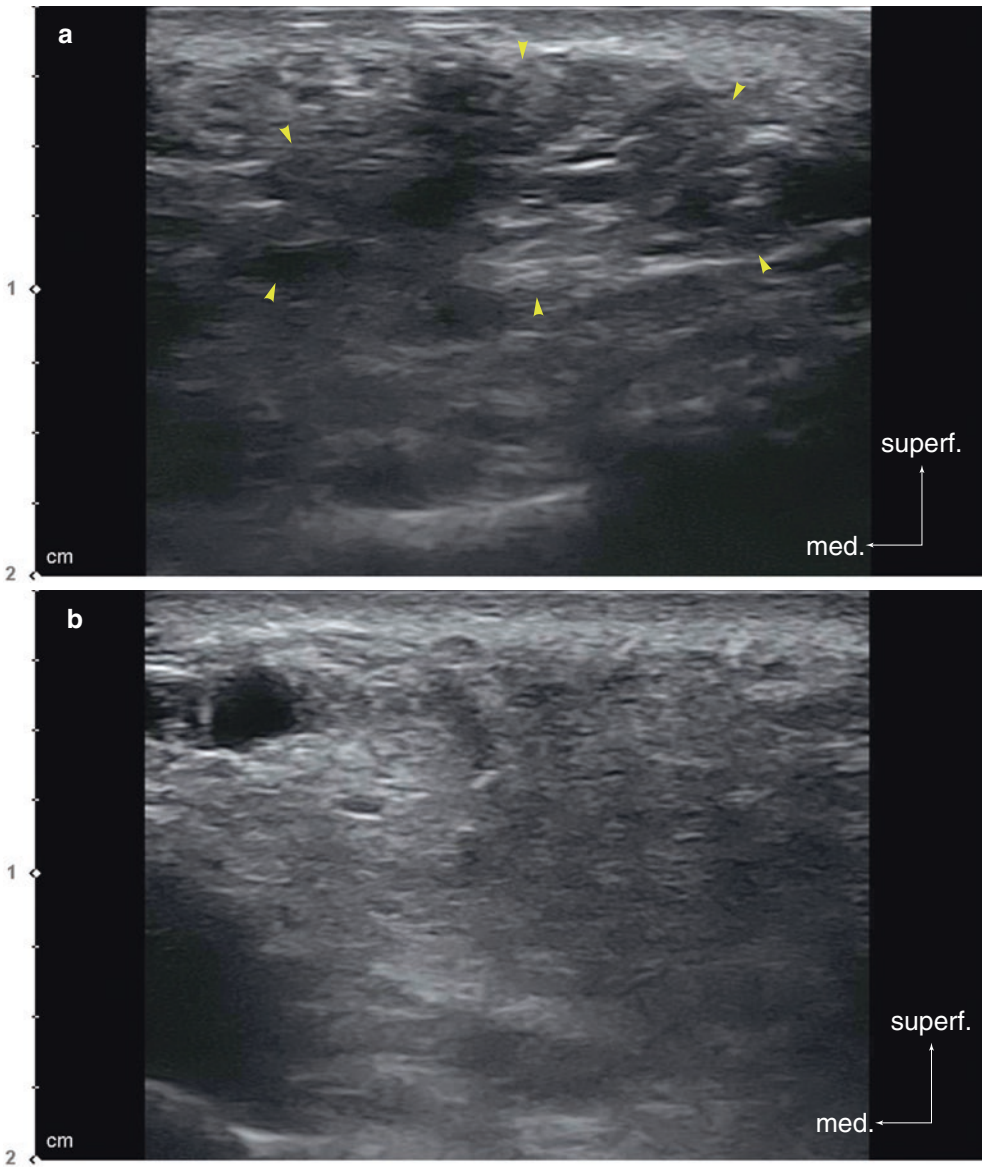

Fig. 9.11 Ultrasonography-guided filler removal on the midface. (**a**) Before injection, B mode (transverse view, 15 MHz by linear transducer) and (**b**) immediately after injection: collapsed filler, B mode (transverse view, 15 MHz by linear transducer) (yellow arrowheads: HA filler). (Published with kind permission of © Ji-Soo Kim 2020. All Rights Reserved)

9.2.5 Nose

Filler nose augmentations are one of the most highly performed procedures in Asia. The nose is also where most vascular-related complications appear. Checking the vascular anatomy of the target nasal augmentation area with US is essential to minimize complications. The US image of the transverse and longitudinal view of the nose shows moderate thickness in the soft tissue of the dorsum of the nose (Figs. 5.25, 5.26, and 5.27).

The ideal plane for filler nose augmentation is the supraperiosteal and supraperichondrial layer below the nasal mm. Superficial fatty layer (subcutaneous layer) injection is also possible, but the risks of vascular accidents are higher in this area. This US image presents the filler as hypoechoic masses in several different parts of the superficial and deep fatty layer (Fig. 9.12).

Bolus injection with hard fillers are usually applied to the nose, which increase the hypoechoicity, making it easier to differentiate with other tissues. Lateral filler migration can be observed due to the filler cohesiveness, amount, and injection site. Nasal widening cases have more retention of water within the filler and look hyperechoic (Fig. 9.13).

Filler augmentation is not recommended in patients who have had previous rhinoplasty because the implants make the supraperiosteal and supraperichondrial planes ambiguous (Fig. 9.14), and complications may arise more.

Since the nose has a high probability of complications, the transverse and longitudinal view in Doppler mode should meticulously scan and confirm the location of the dorsal nasal a. and intercanthal v. Since the nasal dorsum is a thin area, a small probe such as the hockey-stick transducer is convenient. Similar to the nasolabial fold

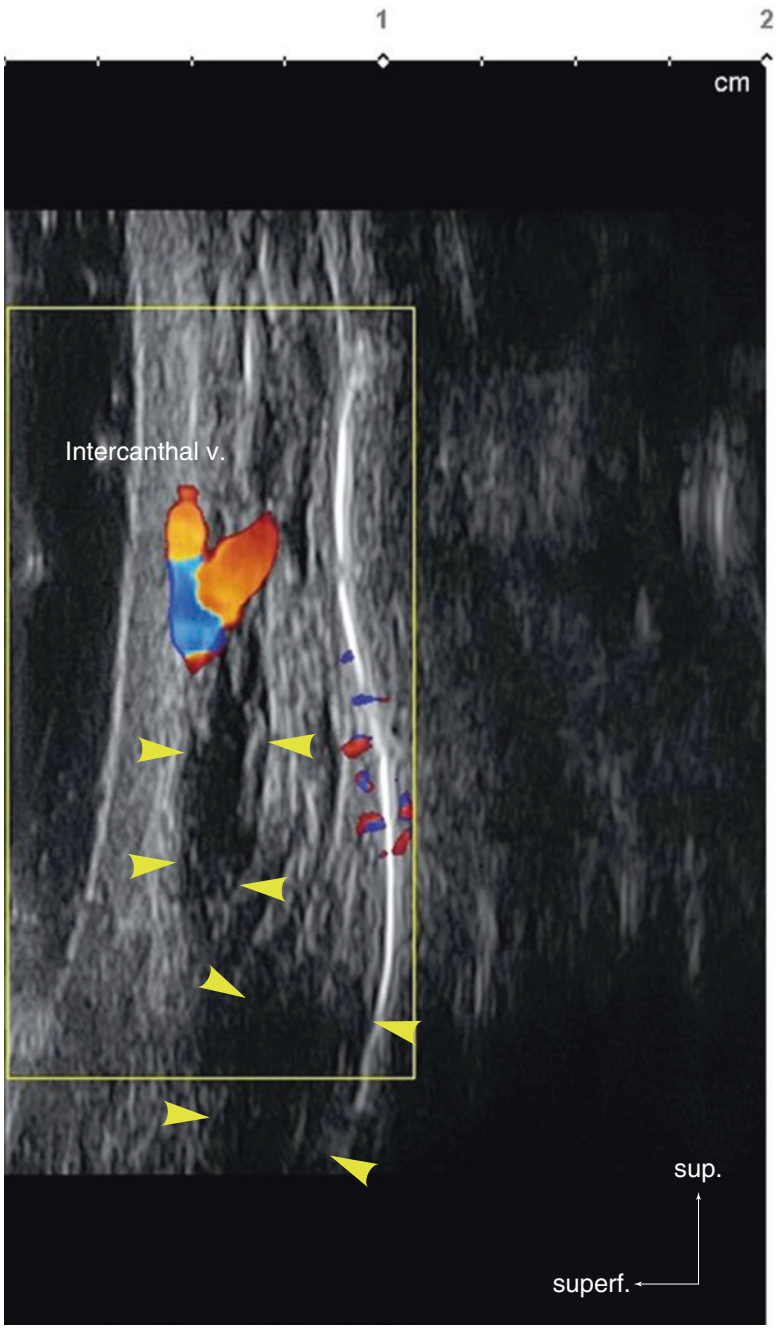

Fig. 9.12 Ultrasonography of the HA filler for the dorsum augmentation, B mode (longitudinal view, 15 MHz by linear transducer) (yellow arrowheads: HA filler). (Published with kind permission of © Ji-Soo Kim 2020. All Rights Reserved)

(NLF) case, the power Doppler mode or spectral Doppler mode can be applied for nasal US procedures. However, the vessels are more apparent under color Doppler compared to the NLF. Dorsum augmentation is typically performed in the midline of the nose. The midline and periosteal planes of the nose have been considered safe injection areas, but recent literature has reported the presence of vessels in the midline. This US image shows vessels in the midline; in these cases, the filler should be situated in the supraperiosteal plane (Fig. 5.25). Vessels are rarely seen in the deep fatty layer, but this area is not 100% safe. Vessel diameters in this area are larger than anticipated, sometimes being 1/3–1/2 thickness of the whole soft tissue and can lead to complications, especially in the nose and radix.

Clinicians have to find the safest and most aesthetically enhancing area when injecting fillers, and the Doppler mode can be very beneficial in analyzing the vascular anatomy. However, when the vascular anatomy is unfavorable, filler injection must be abandoned. It is not difficult distinguishing the filler during US-guided hyaluronidase injection in this region. US-guided injection can be attempted when the probability of vascular complications is high, but the main key in minimizing the risk is to thoroughly detect the vessel locations before an injection. US imaging can capture volume loss after accurate injection of the hyaluronidase (Fig. 9.15).

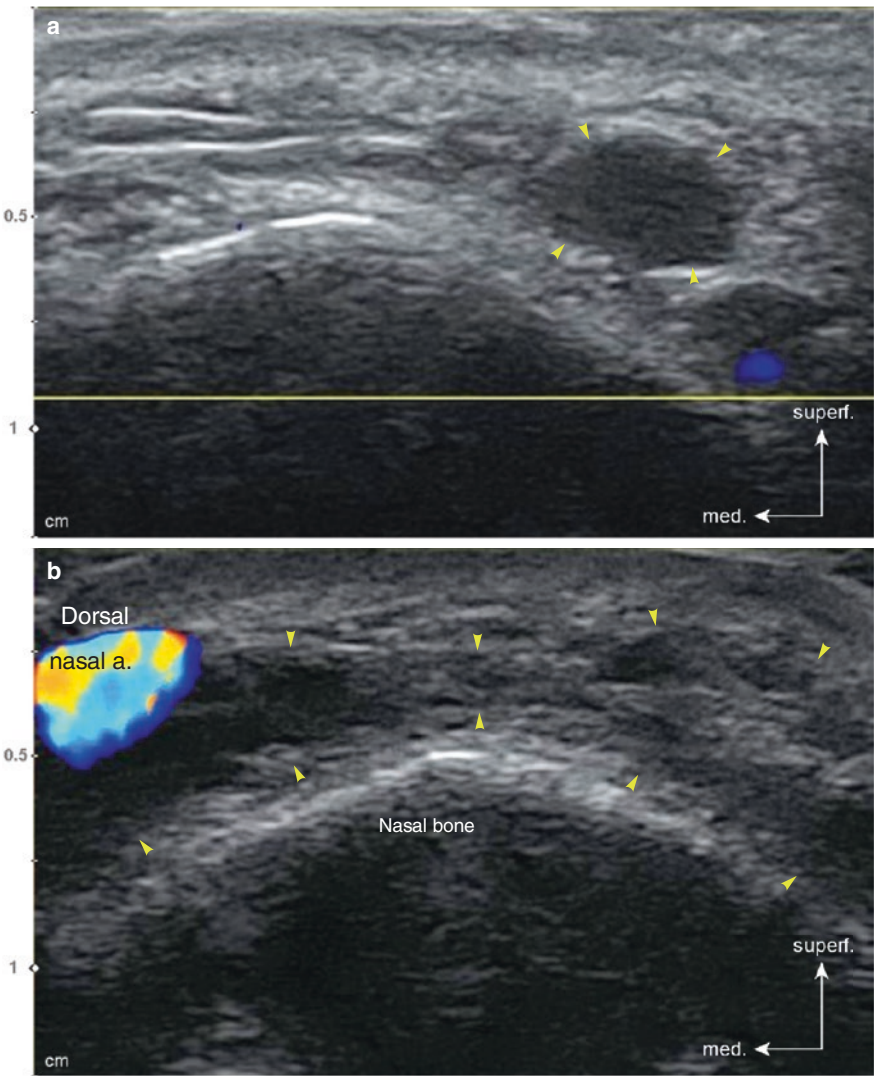

Fig. 9.13 Ultrasonography of the HA filler on the dorsum of nose. (**a**) Migrated filler, Doppler mode (transverse view, 15 MHz by linear transducer) and (**b**) widened nose, Doppler mode (transverse view, 15 MHz by linear transducer) (yellow arrowheads: HA filler). (Published with kind permission of © Ji-Soo Kim 2020. All Rights Reserved)

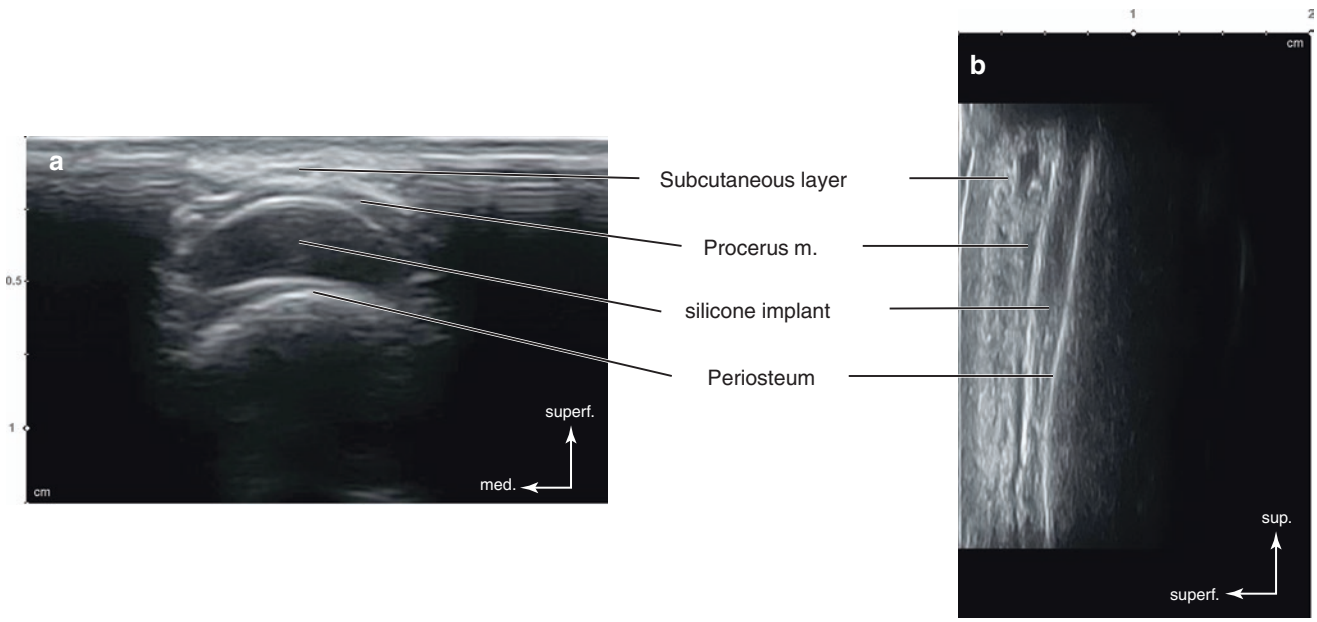

Fig. 9.14 Ultrasonography of the silicone implant on the dorsum of nose. (**a**) B mode (transverse view, 15 MHz by linear transducer) and (**b**) B mode (longitudinal view, 15 MHz by linear transducer). (Published with kind permission of © Ji-Soo Kim 2020. All Rights Reserved)

9.2.6 Nasolabial Fold

The NLF is one of the most favored filler indications while being one of the riskiest areas because of complications such as skin necrosis in the ala of the nose, blindness, and embolism. The proposed filler injection layer is the superficial dermal/subdermal layer or the deep section below the SMAS or the deep medial cheek pad above the periosteum. US interpretation is difficult in this area because the NLF is entangled with the superficial and deep fat (Figs. 6.26 and 6.28). Migration after filler injection into the NLF is often observed because the NLF area is affected by the upper lip elevators since the deep medial cheek fat pad is soft, and the fat pad is located lateral to the infraorbital space. Since the lip elevators are attached to the NLF and the OOr m. lies tightly below the skin with minimal subcutaneous fat, migration is possible if the filler is not meticulously injected into the dermal or subdermal layer (Fig. 9.16).

The facial a. located in the NLF rests in the subcutaneous layer or the muscle level. Additional precautions should be taken when the artery is positioned in the subdermal level of the superficial subcutaneous layer (Figs. 6.26, 6.28, and 6.29).

When the vascular complications are a concern, US-guided injection may be an option. Deep injection using a cannula will penetrate the deep part of the OOr m. until the deep medial cheek fat appears. This approaches below the muscle layer where the facial a. exists (Fig. 9.17a). The periosteal injection plane is advantageous in deep injections. In superficial injections, proceeding toward the dermal area is difficult with a blunt tip cannula. Even if the tip is turned up, this only sends the needle around the superficial layer of the OOr m. US-guided injection allows visualization of the advancing cannula toward the target layer and assists in avoiding the subcutaneous layer where the facial a. lies (Fig. 9.17b).

The most crucial aspect in filler removal is detecting the filler location and extent. Deep bolus injections are apt to migrate and should be closely checked. Filler compartments such as capsules and septa can be formed according to filler direction, filler injection techniques, and filler rheology. Lateral migration is common; in such cases, all compartments need to be dissolved separately using hyaluronidase (Fig. 9.18).

Implants can also be observed in this area. History taking and US imaging are beneficial in finding and removing the fillers surrounding the implant (Fig. 9.19).

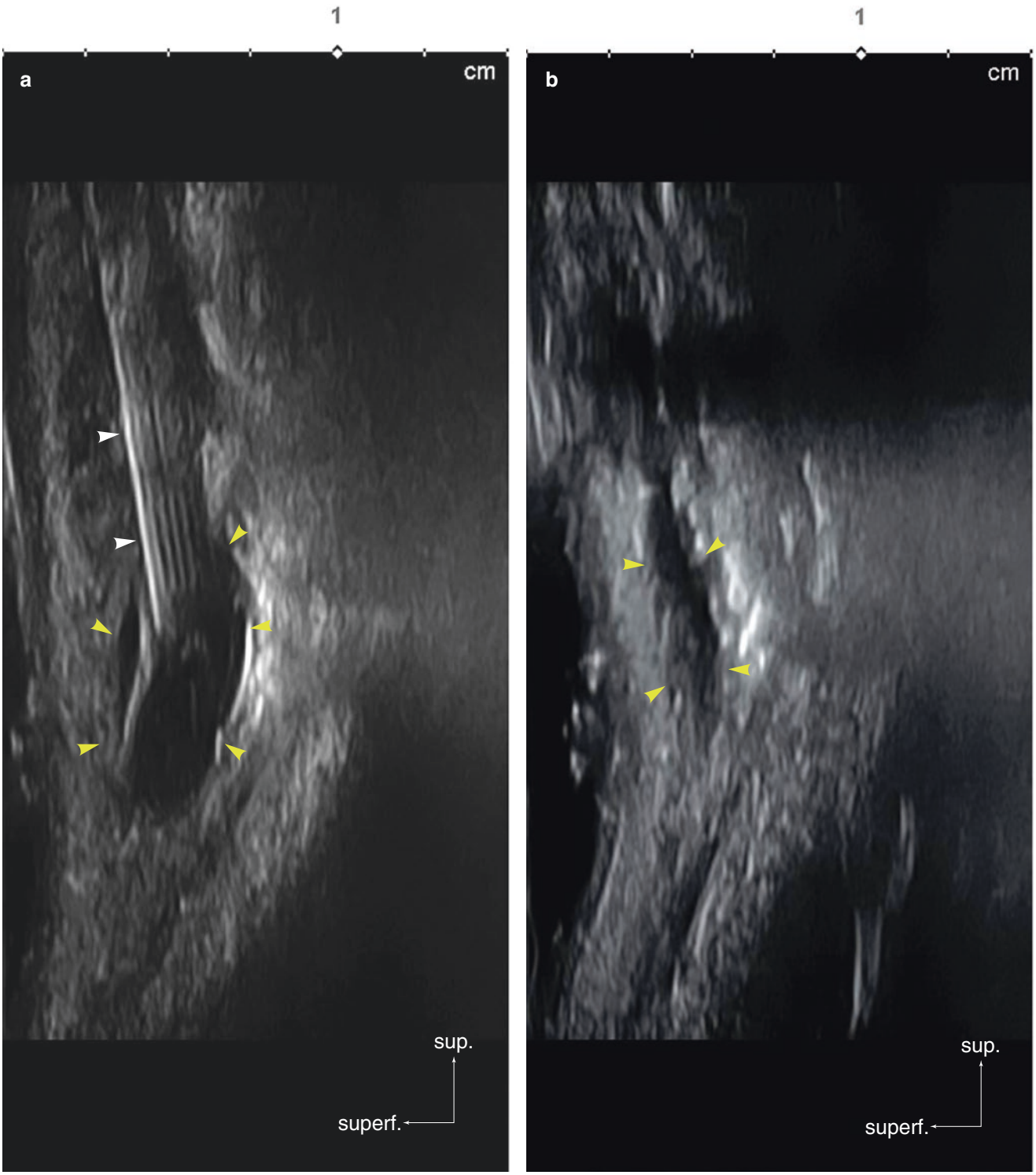

Fig. 9.15 Ultrasonography-guided filler removal on the dorsum of nose. (**a**) During injection, B mode (longitudinal view, 15 MHz by linear transducer) and (**b**) after injection, B mode (longitudinal view, 15 MHz by linear transducer) (yellow arrowheads: HA filler, white arrowheads: injection needle). (Published with kind permission of © Ji-Soo Kim 2020. All Rights Reserved)

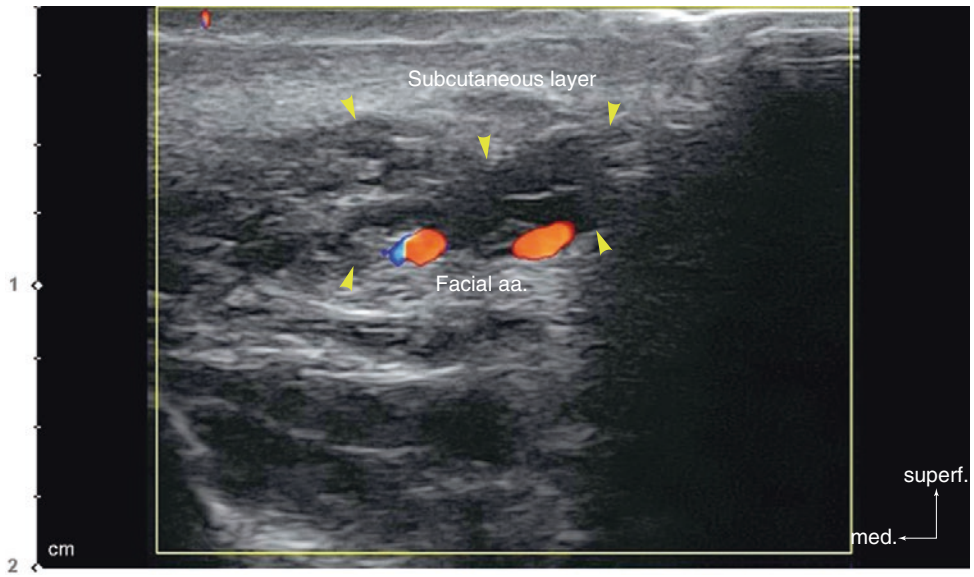

Fig. 9.16 Ultrasonography of the filler migration underneath the nasolabial fold, Doppler mode (longitudinal view, 15 MHz by linear transducer) (yellow arrowheads: HA filler). (Published with kind permission of © Ji-Soo Kim 2020. All Rights Reserved)

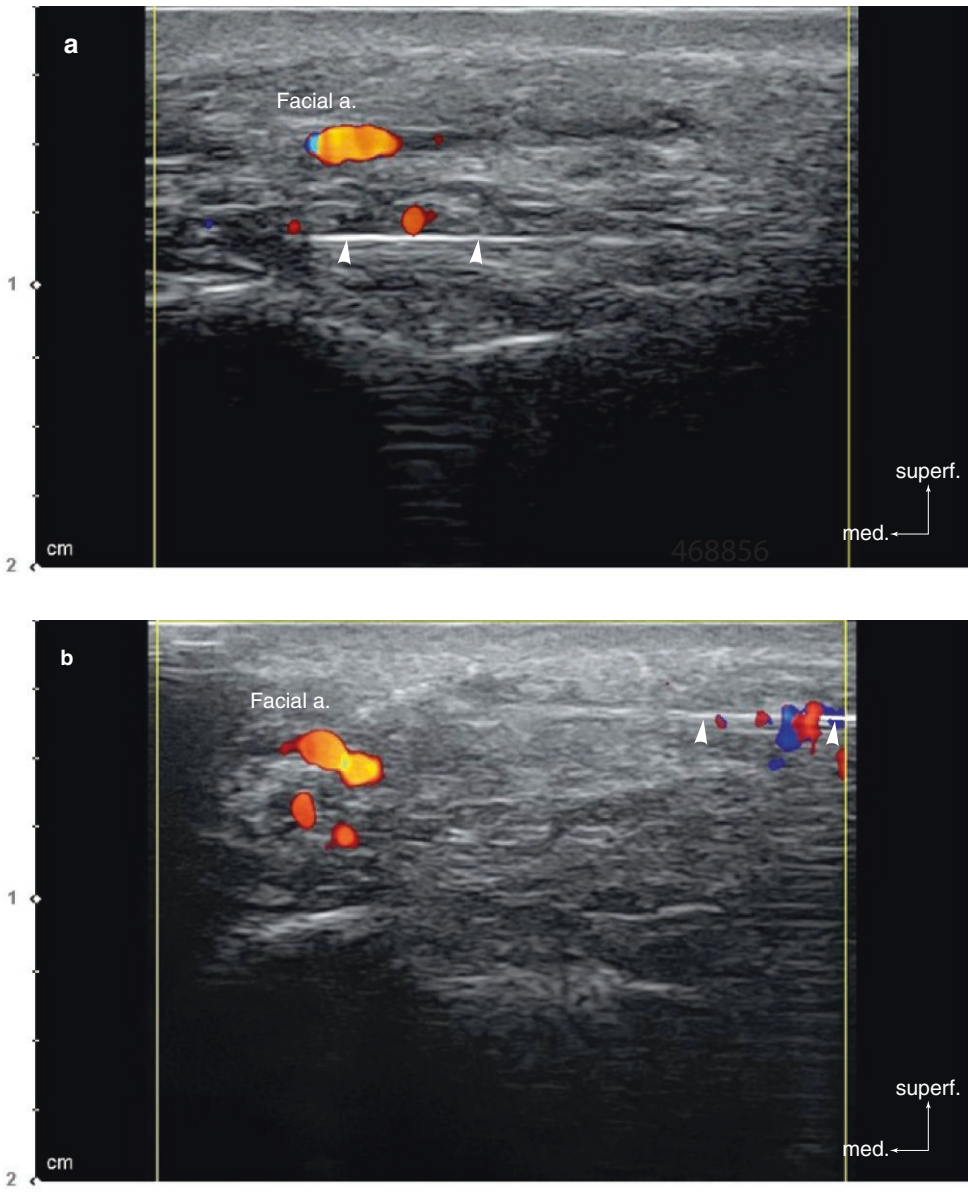

Fig. 9.17 Ultrasonography-guided filler injection for the nasolabial fold augmentation. (**a**) Deep injection, Doppler mode (transverse view, 15 MHz by linear transducer) and (**b**) superficial injection, Doppler mode (transverse view, 15 MHz by linear transducer) (white arrowheads: injection needle). (Published with kind permission of © Ji-Soo Kim 2020. All Rights Reserved)

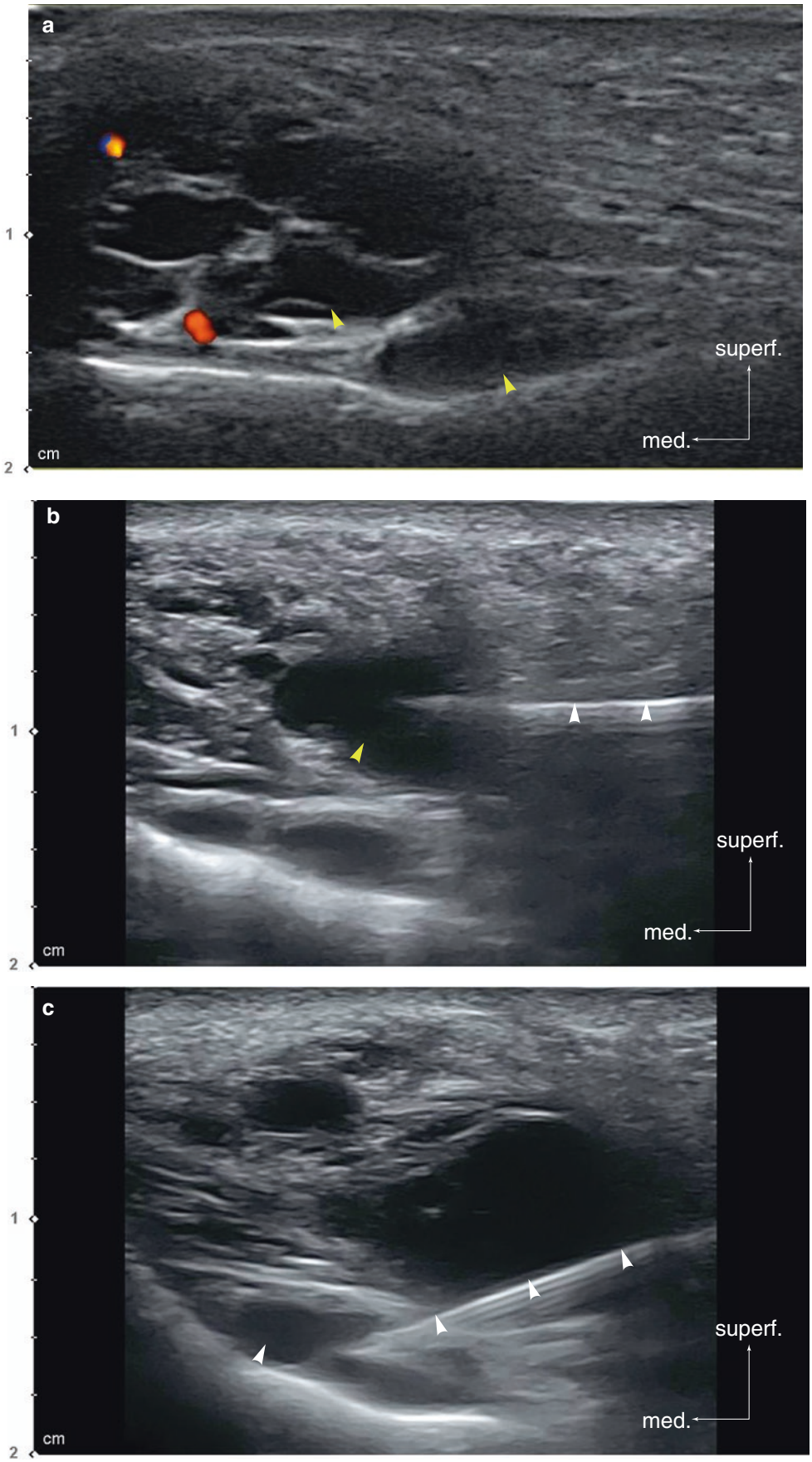

Fig. 9.18 Ultrasonography-guided HA filler removal underneath the nasolabial fold. (**a**) Compartmented filler, Doppler mode (transverse view, 15 MHz by linear transducer), (**b**) superficial part, B mode (transverse view, 15 MHz by linear transducer), and (**c**) deep part, B mode (transverse view, 15 MHz by linear transducer) (yellow arrowheads: HA filler, white arrowheads: injection needle). (Published with kind permission of © Ji-Soo Kim 2020. All Rights Reserved)

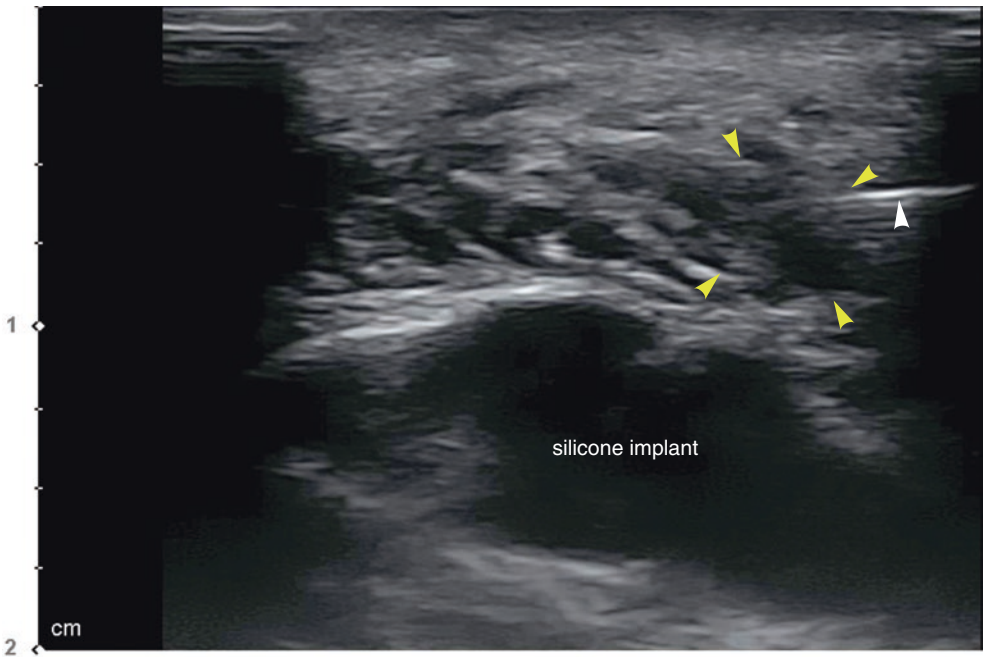

Fig. 9.19 Ultrasonography-guided HA filler removal above the silicone implant underneath the nasolabial fold, B mode (transverse view, 15 MHz by linear transducer) (yellow arrowheads: HA filler, white arrowhead: injection needle). (Published with kind permission of © Ji-Soo Kim 2020. All Rights Reserved)

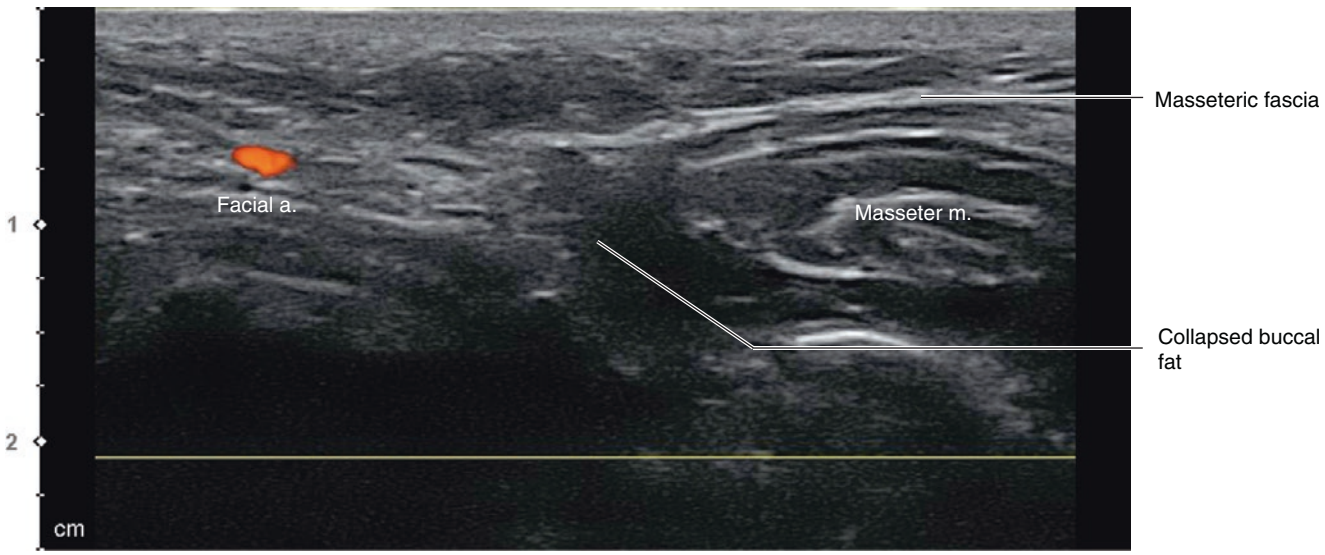

Fig. 9.20 Ultrasonography of the buccal fat collapse in a patient with sunken cheek, Doppler mode (transverse view, 15 MHz by linear transducer). (Published with kind permission of © Ji-Soo Kim 2020. All Rights Reserved)

9.2.7 Anterior Sunken Cheek and Subzygomatic Depression

The anterior sunken cheek is generally owing to atrophy after buccal fat collapse anterior to the masseter m. (Fig. 9.20).

Sunken cheek rejuvenation is done by an injection into the superficial fat of the subcutaneous layer above the SMAS or in the buccal fat pad layer below the SMAS. The SMAS layer is distinct under US imaging, and because high volume injection in the subcutaneous layer will accompany irregularities and inferior migration, buccal fat injection below the SMAS is favored. However, injection into the buccal fat pad may necessitate larger volumes of filler to achieve similar results (Fig. 9.21).

Subzygomatic depression is resolved by injecting filler into the superficial subcutaneous layer above the SMAS or in the parotid temporal fascia below the SMAS. Crucial anatomical structures lie deeply inferior to this fascia, and there are minimal chances of damage when injected above this fascia (Fig. 9.22).

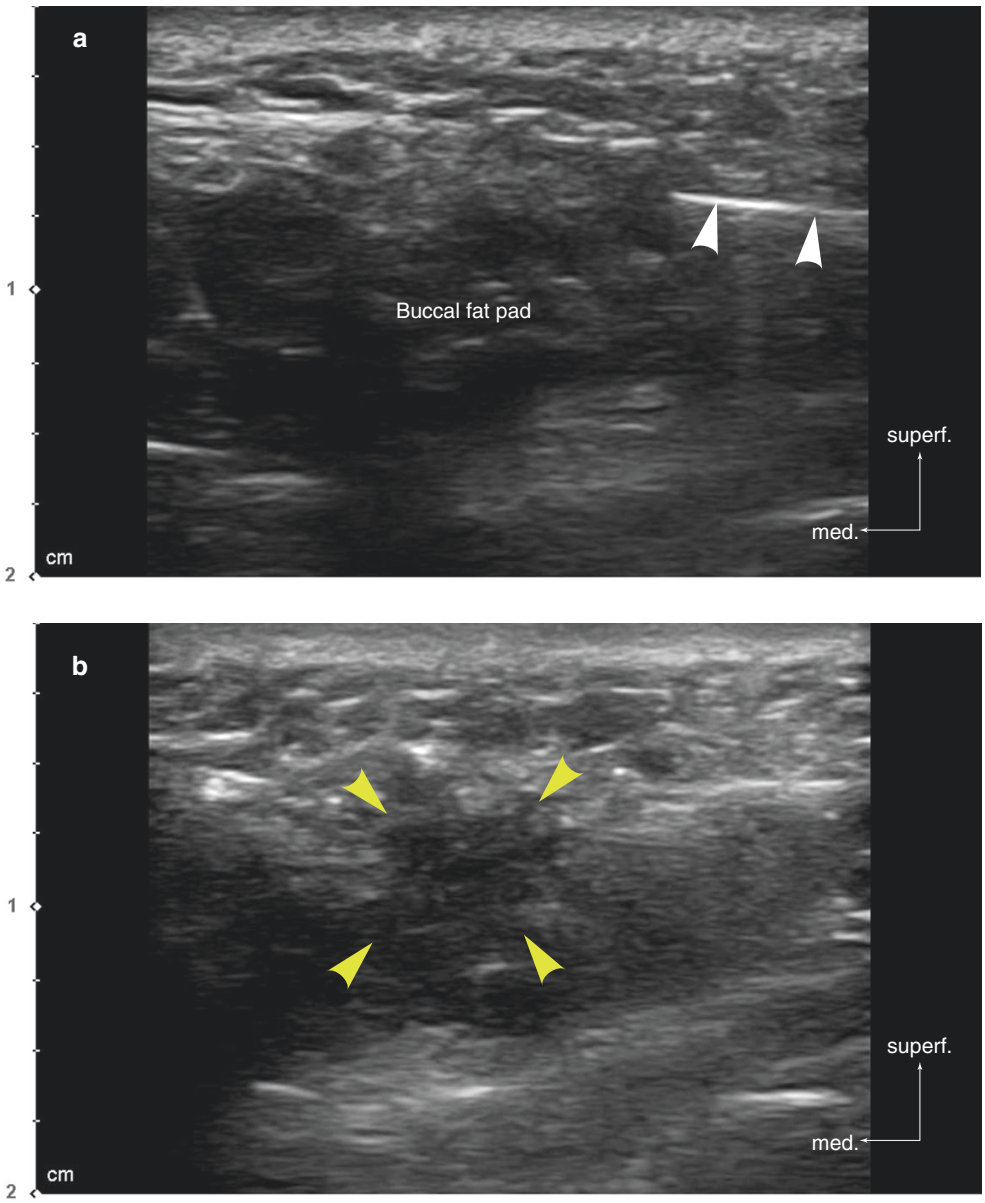

Fig. 9.21 Ultrasonography-guided filler injection into the buccal fat pad. (**a**) During injection, B mode (transverse view, 15 MHz by linear transducer) and (**b**) after injection, B mode (transverse view, 15 MHz by linear transducer) (yellow arrowheads: HA filler, white arrowheads: injection needle). (Published with kind permission of © Ji-Soo Kim 2020. All Rights Reserved)

9.2.8 Marionette Line, Prejowl Sulcus, and Perioral Area

Lower facial rejuvenation procedures demand soft filler injection into the subdermal or subcutaneous layers to alleviate wrinkles. Excess volume augmentation in the jowls may cause unfavorable aesthetic results, such as noticeable jowl. This US image shows the HA filler stable in the subcutaneous layer of the marionette line medial to the depressor anguli oris m. (Fig. 9.23). During marionette line correction, caution should be paid not to inject into the mental and inferior labial aa., which are branches of the facial a. (Fig. 9.23). A cannula injection should target the subdermal layer and focus on early detection of such vessels to avoid complications before injection.

9.2.9 Chin

When augmenting the chin, the ideal injection plane is the supraperiosteal layer of the mentum. The US transverse view of the chin reveals symmetric mentalis m. and muscle fibers attached to the dermis. Injected fillers are generally located above the periosteum (Fig. 9.24).

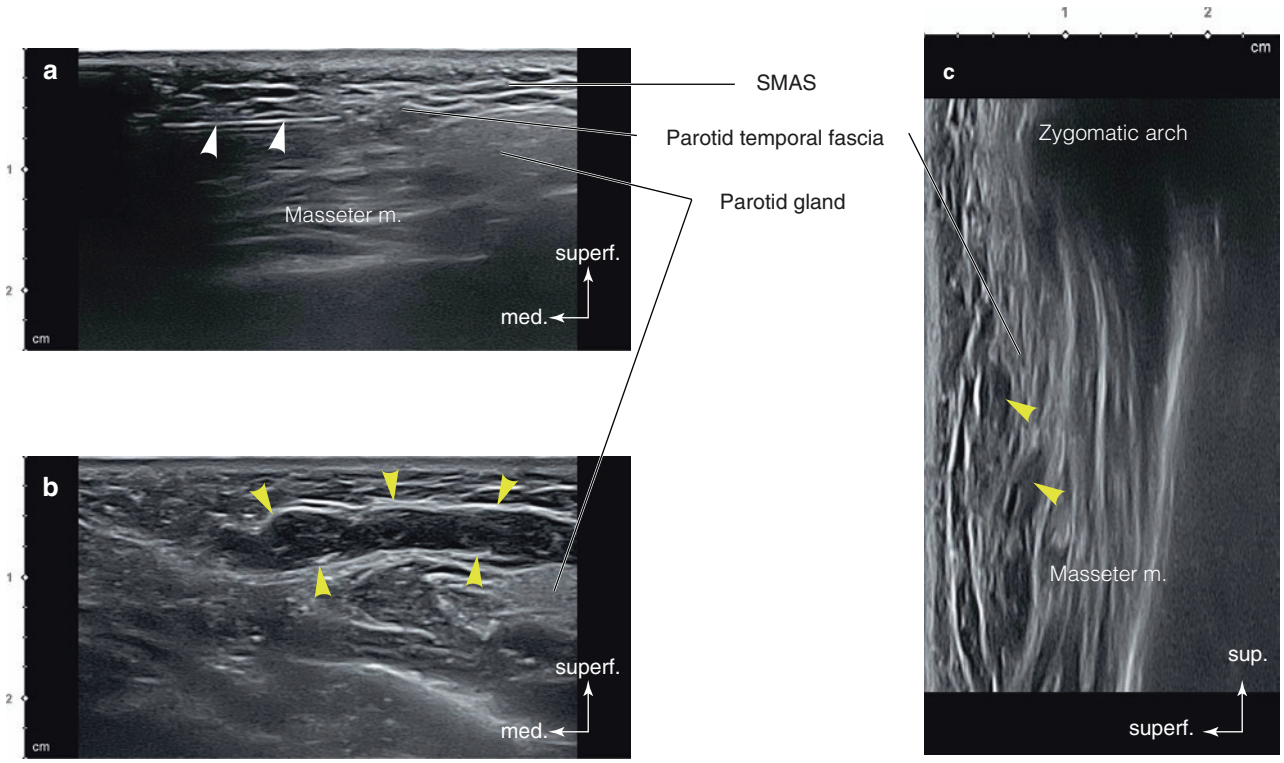

Fig. 9.22 Ultrasonography-guided filler injection for the improvement of the subzygomatic depression. (**a**) During injection, B mode (transverse view, 15 MHz by linear transducer), (**b**) filler below the SMAS, B mode (transverse view, 15 MHz by linear transducer), and (**c**) filler in the subcutaneous layer, B mode (longitudinal view, 15 MHz by linear transducer) (yellow arrowheads: HA filler, white arrowheads: injection needle). (Published with kind permission of © Ji-Soo Kim 2020. All Rights Reserved)

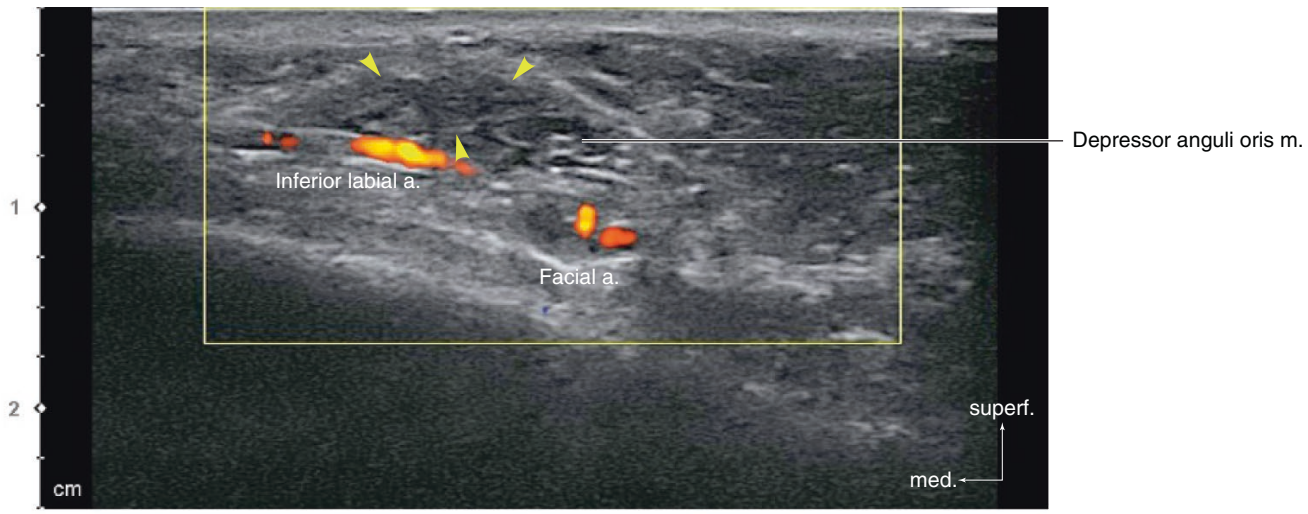

Fig. 9.23 Ultrasonography of HA filler for the marionette line improvement, Doppler mode (transverse view, 15 MHz by linear transducer) (yellow arrowheads: HA filler). (Published with kind permission of © Ji-Soo Kim 2020. All Rights Reserved)

In some cases, chin implants are usually located above the periosteum, and sometimes, granulomas may also be observed (Fig. 9.25).

This US image shows the filler as a hypoechoic solid mass immediately after chin injection, but soon it turns into a heterogeneous mass overtime. This phenomenon occurs because the mentalis m. moves more actively in this area, compared to areas such as the nose, and migration is common. A layer-by-layer technique using hyaluronidase is effective in removing injected filler materials (Fig. 9.26).

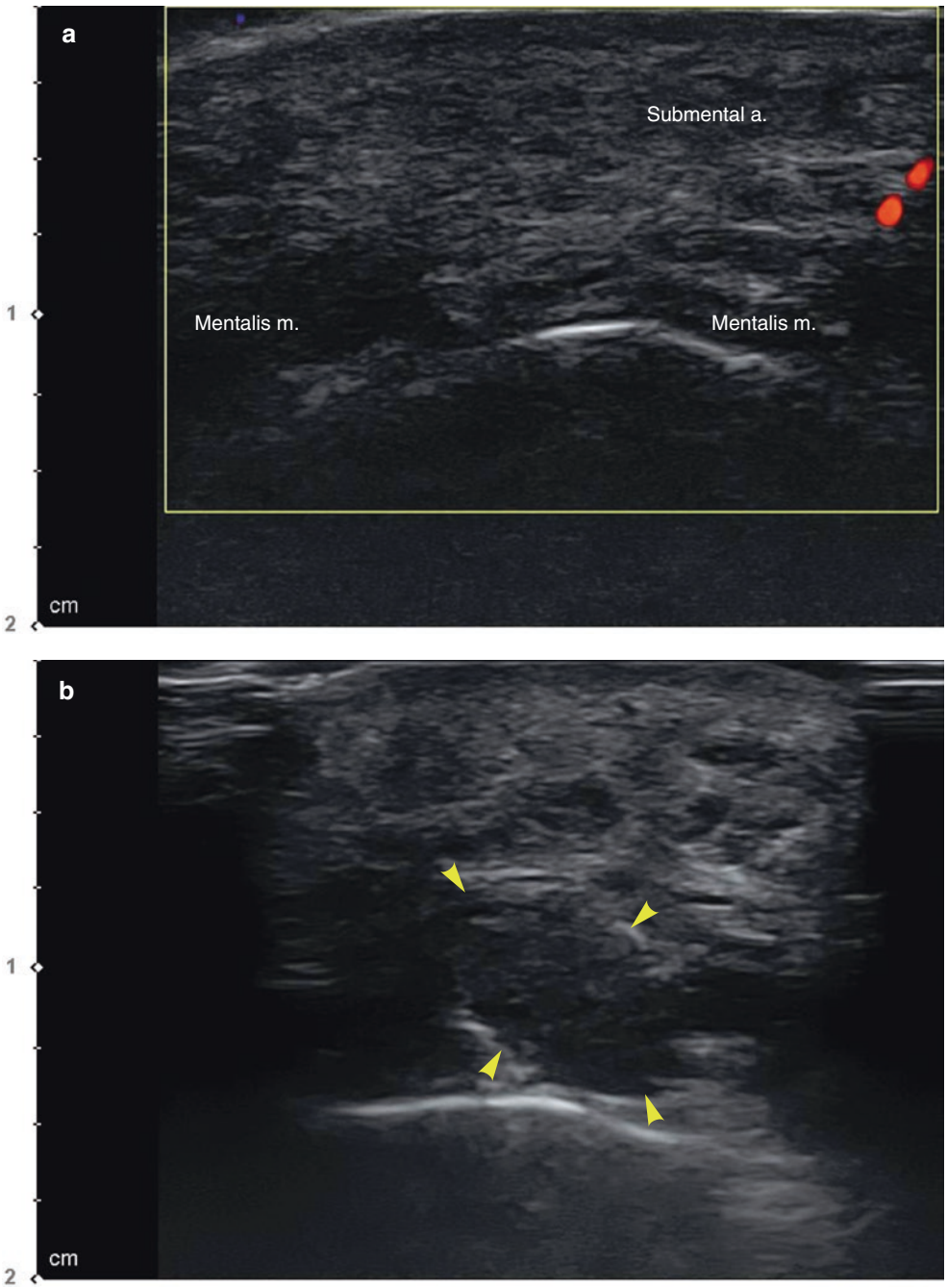

Fig. 9.24 Ultrasonography of the HA filler for the chin augmentation. (**a**) Before injection, Doppler mode (transverse view, 15 MHz by linear transducer) and (**b**) after injection, B mode (transverse view, 15 MHz by linear transducer) (yellow arrowheads: HA filler). (Published with kind permission of © Ji-Soo Kim 2020. All Rights Reserved)

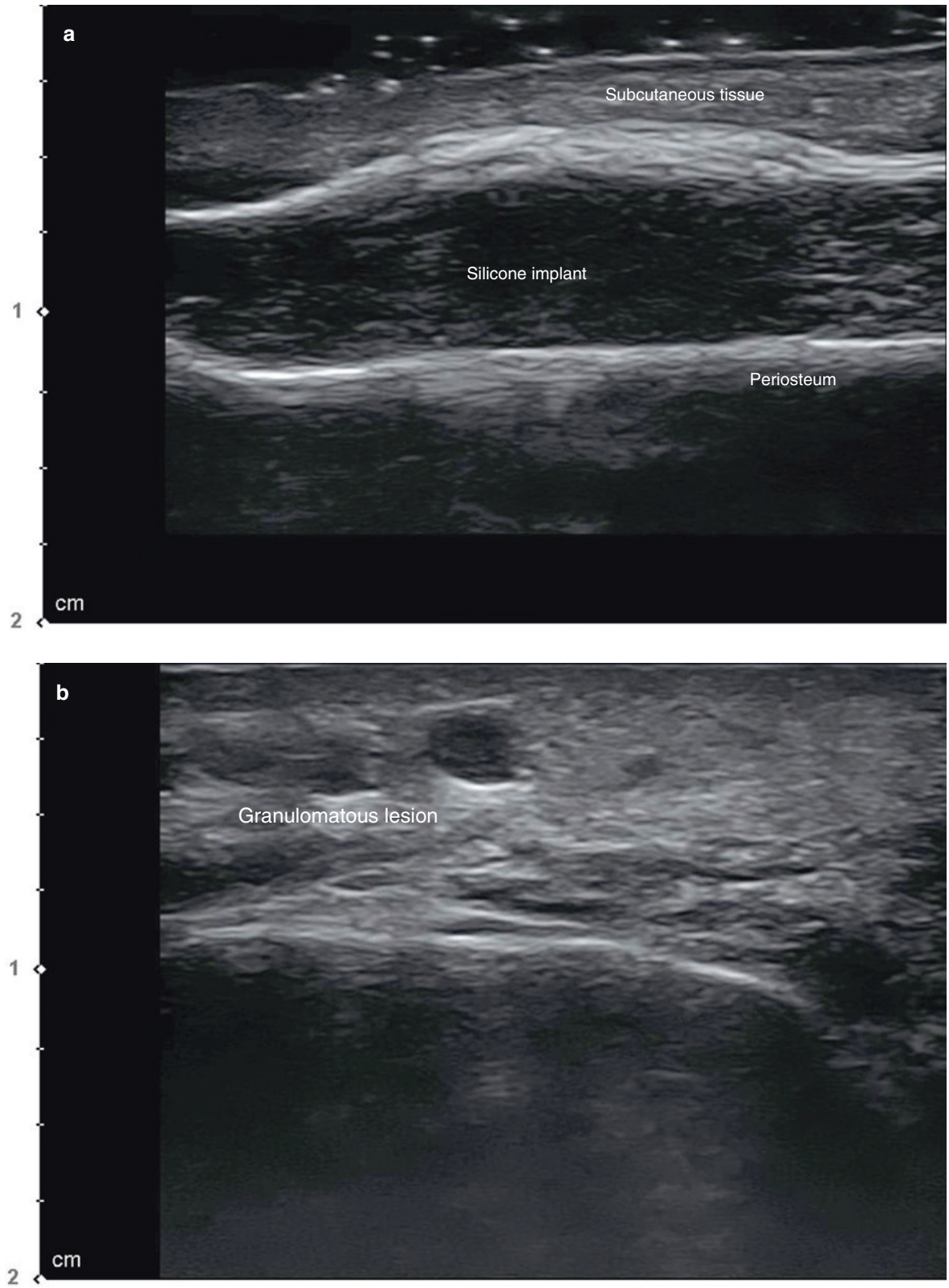

Fig. 9.25 Ultrasonography of the silicone implant on the chin. (**a**) B mode (transverse view, 15 MHz by linear transducer) and (**b**) foreign body granuloma, B mode (transverse view, 15 MHz by linear transducer). (Published with kind permission of © Ji-Soo Kim 2020. All Rights Reserved)

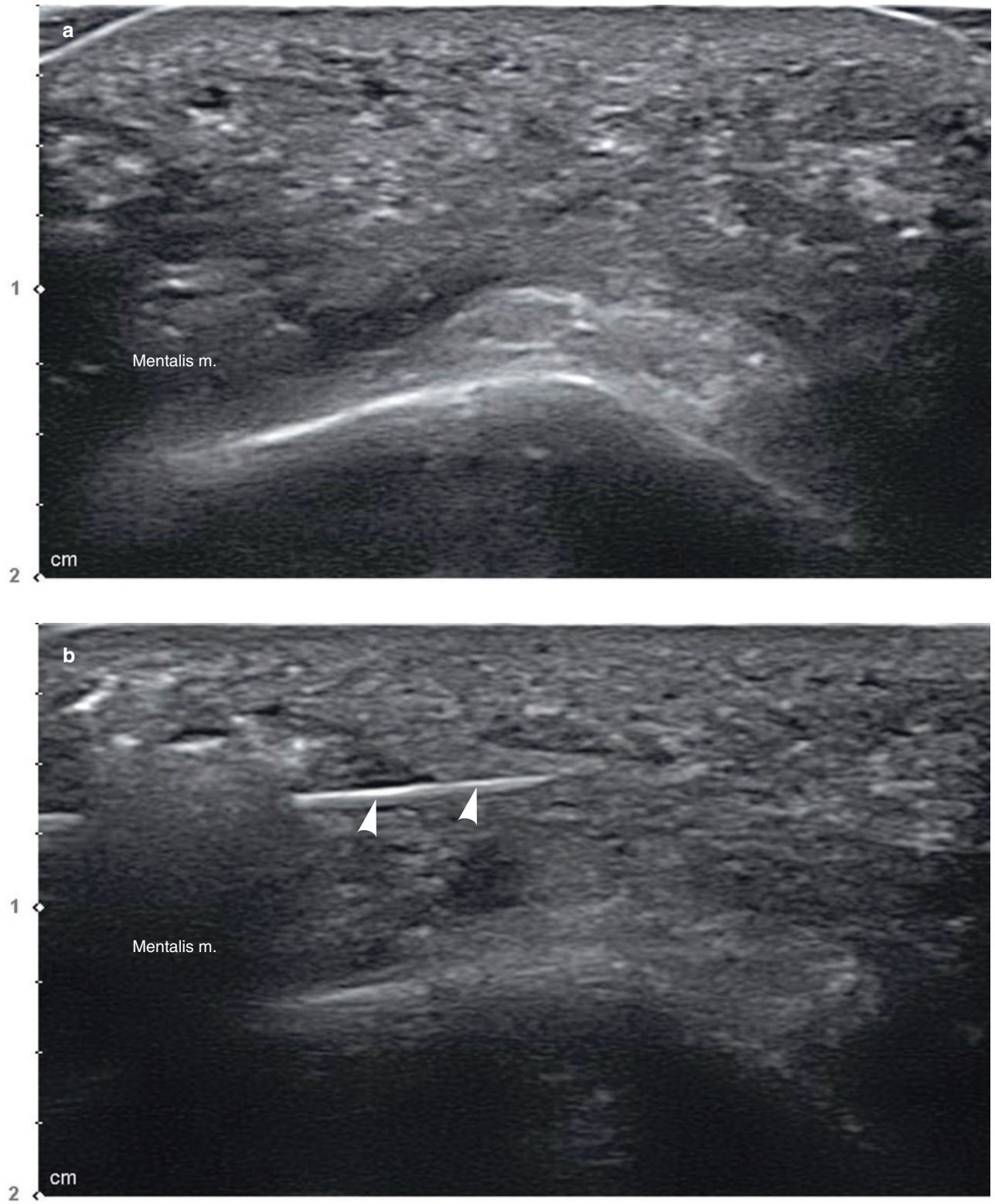

Fig. 9.26 Ultrasonography-guided HA filler removal on the chin. (**a**) Before injection, B mode (transverse view, 15 MHz by linear transducer) and (**b**) during injection, B mode (transverse view, 15 MHz by linear transducer) (while arrowheads: HA filler). (Published with kind permission of © Ji-Soo Kim 2020. All Rights Reserved)

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