Facial Danger Zones: Techniques to Maximize Safety during Soft-Tissue Filler Injections

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Summary: Given the short recovery and immediate results, facial fillers have become a popular alternative to surgical rejuvenation of the face. Reported complications arising from facial filler injections include erythema, tissue loss, blindness, stroke, and even death. In this article, the authors describe their anatomically based techniques to minimize risk and maximize safety when injecting in the facial danger zones, including the glabella/brow, temporal region, perioral region, nasolabial fold, nose, and infraorbital region. Complications generally arise secondary to vasculature injury and/or cannulation with filler. The authors have outlined their preferred injection techniques in the facial danger zones with respect to the pertinent anatomy in an attempt to minimize risk and maximize results. Most importantly, the practitioner should be able to recognize complications and address them immediately. (*Plast. Reconstr. Surg.* 139: 1103, 2017.)

Given the short recovery and immediate results, facial fillers have become a popular alternative to surgical rejuvenation of the face. For the past 6 years, filler injections have ranked behind only botulinum toxin injections for the most popular nonsurgical cosmetic procedure.[1] Given current trends, it becomes all the more important that practitioners learn safe, predictable techniques to achieve optimal results with facial filler injections. (**See Video, Supplemental Digital Content 1**, which identifies the facial danger zones and demonstrates how to safely inject facial fillers in these areas, available in the "Related Videos" section of the full-text article on PRSJournal.com or, for Ovid users, available at ***http://links.lww.com/PRS/C132***.)

Reported complications arising from facial filler injections include erythema, tissue loss, blindness, stroke, and even death. The most severe complications generally occur secondary to inadvertent damage or cannulation of vasculature. Generally, we use only hyaluronic acid fillers except on rare occasions. Hyaluronic acid fillers can be reversed with hyaluronidase, increasing their safety profile. In this article, we describe our anatomically based techniques to minimize risk and maximize safety when injecting in the facial danger zones (Table 1).

TECHNIQUE FOR SAFETY IN THE GLABELLA AND BROW

The supraorbital, supratrochlear, dorsal nasal, and angular arteries anastomose in the nasoglabellar region to form a vascular arcade. Given the rich network, it becomes obvious how intravascular cannulation can create retrograde propagation of a foreign body to the ophthalmic artery. The arteries quickly become superficial after exiting the orbit and closely abut rhytides, especially the supratrochlear artery and the glabellar frown lines.[2] Therefore, we recommend

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Video 1. Supplemental Digital Content 1 identifies the facial danger zones and demonstrates how to safely inject facial fillers in these areas, available in the "Related Videos" section of the full-text article on PRSJournal.com or, for Ovid users, available at ***http://links.lww.com/PRS/C132***.

dermal injections into the offending rhytides with a low-G′ filler using a serial puncture technique. When injecting in the brow area, digital pressure should be used to occlude the supraorbital and supratrochlear vessels along the rim to prevent backflow in the event of inadvertent injection of the vasculature. (**See Video, Supplemental Digital Content 2**, which demonstrates a technique for safely injecting facial fillers in the glabella and brow, available in the "Related Videos" section of the full-text article on PRSJournal.com or, for Ovid users, available at ***http://links.lww.com/PRS/C133***.) It is extremely important not to err too deep. The vessels can easily be lacerated by improper technique and compressed by adjacent filler given their overall smaller size. An intravascular injection in this area can be devastating, leading to vision loss and/or tissue necrosis.

TECHNIQUE FOR SAFETY IN THE TEMPORAL REGION

To maximize safety when injecting in this area, we generally mix the filler at a 1:1 ratio with 0.5% lidocaine with epinephrine. Starting at the pretrichial line, the injection proceeds lateral to medial in the superficial subcutaneous plane just below the dermis. (**See Video, Supplemental Digital Content 3**, which demonstrates a technique for safely injecting facial fillers in the temporal region, available in the "Related Videos" section of the full-text article on PRSJournal.com or, for Ovid users, available at ***http://links.lww.com/PRS/C134***.) In the temporal region, the superficial temporal artery resides in the temporoparietal fascia. However, as the vessel approaches the lateral border of the frontalis, just above the brow peak, it becomes subcutaneous. The needle should be in constant motion, injecting anterograde and retrograde to displace any vasculature that may be encountered and to minimize the chance of intravenous/intraarterial injection. Strong consideration should be given to a cannula to lessen the chance of vessel puncture. Turning the patient's head medially helps highlight superficial veins, which can then be avoided. Filler can then be massaged around the vessels to provide

Table 1. General Principles for Safe Filler Injection

Use reversible fillers (i.e., hyaluronic acid fillers)
Use small needles (i.e., 27-gauge or smaller)
Use cannulas when appropriate
Use an anterograde/retrograde injection technique, keeping the needle in constant motion
Use small syringes (0.5–1 cc) and inject in small increments
Use low pressure; injections requiring high pressure signify danger and/or inappropriate location
Use extreme caution when injecting in areas of previous trauma/scar or avoid altogether
Be aware of the pertinent anatomy outlined in the danger zones
Have a filler rescue kit available at all times

Video 2. Supplemental Digital Content 2 demonstrates a technique for safely injecting facial fillers in the glabella and brow, available in the "Related Videos" section of the full-text article on PRSJournal.com or, for Ovid users, available at ***http://links.lww.com/PRS/C133***.

an even fill. Although it is not our preferred method, the injection can also be performed deep at the preperiosteal level. The filler can then be manipulated by massage to fill deficient areas. Naturally, a larger amount of filler will be required when injecting at this level to transmit the gains superficially. The middle temporal vein runs approximately 2 cm above and parallel to the zygomatic arch.[3] Thus, deep injections should be performed within a fingerbreadth of the arch or at least several centimeters above it. Finally, the frontal branch of the artery can still be injured if it is lacerated by a needle going from superficial to deep.

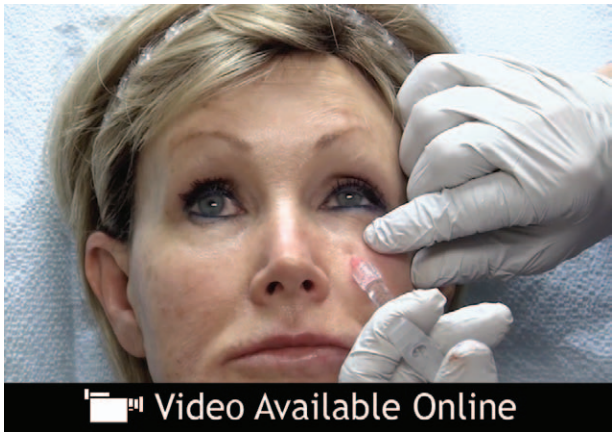
Video 3. Supplemental Digital Content 3 demonstrates a technique for safely injecting facial fillers in the temporal region, available in the "Related Videos" section of the full-text article on PRSJournal.com or, for Ovid users, available at ***http://links.lww.com/PRS/C134***.

TECHNIQUE FOR SAFETY IN THE INFRAORBITAL REGION

Overall, when injecting deep into the midface, measurements should be kept in mind to avoid intravascular cannulation or vascular injury. Generally, the infraorbital foramen will be located approximately 33 to 40 percent of the distance between the medial and lateral canthi up to 11 mm below the infraorbital rim.[4–10] Clinically, it is generally in the vertical plane of the medial limbus, or immediately lateral, slightly less than one fingerbreadth below the orbital rim. We avoid direct deep injections into this area, going just lateral. Injections more medial, especially approaching the medial canthus, should be avoided completely. If filler is needed in this area, it can be injected deep laterally and pushed medially. (**See Video, Supplemental Digital Content 4**, which demonstrates a technique for safely injecting facial fillers in the infraorbital region, available in the "Related Videos" section of the full-text article on PRSJournal.com or, for Ovid users, available at ***http://links.lww.com/PRS/C135***.)

TECHNIQUE FOR SAFETY IN THE UPPER LIP

When injecting, the height of the artery is less important than the depth of the artery. The superficial labial artery generally runs between the orbicularis oris muscle and labial mucosa, and/or within the muscle itself. Therefore, we recommend a linear threading technique at or just below the vermilion-cutaneous border, injecting



Video 4. Supplemental Digital Content 4 demonstrates a technique for safely injecting facial fillers in the infraorbital region, available in the "Related Videos" section of the full-text article on PRSJournal.com or, for Ovid users, available at ***http://links.lww.com/PRS/C135***.

less than 3 mm deep using a soft filler with an intermediate- or low-G′ filler to disperse more easily, thus decreasing the incidence of irregularities.[11] (**See Video, Supplemental Digital Content 5**, which demonstrates a technique for safely injecting facial fillers in the upper lip, commissure, and lower lip, available in the "Related Videos" section of the full-text article on PRSJournal.com or, for Ovid users, available at ***http://links.lww.com/PRS/C136***.) This technique augments the vermillion-cutaneous border. If the patient is volume deficient, the needle can be directed more inferiorly within the dry vermillion or injected directly at that level, once again superficially using a linear threading technique. Laterally, the artery generally runs superior to the vermillion border of the lip. However, as the artery passes Cupid's bow, it can be 1 to 4 mm inferior to the vermillion border.[11] Medially, it is more important to inject superficially because the needle will be much closer to the artery than laterally. Likewise, there can be small septal branches from the superficial labial artery coursing over the orbicularis that may traverse this area as well.[11] The upper lip fine rhytides ("smoker's lines") can be injected dermally with a low-G′ filler beginning at the vermilion-cutaneous border using a liner threading technique.

Video 5. Supplemental Digital Content 5 demonstrates a technique for safely injecting facial fillers in the upper lip, commissure, and lower lip, available in the "Related Videos" section of the full-text article on PRSJournal.com or, for Ovid users, available at ***http://links.lww.com/PRS/C136***.

TECHNIQUE FOR SAFETY IN THE COMMISSURE

When injecting the lip commissures, we recommend a crosshatch technique while occluding the takeoff of the superior labial artery (**see Video, Supplemental Digital Content 5**, ***http://links.lww.com/PRS/C136***). This point can be found by placing a thumb beside the corner of the mouth and applying lateral traction for injection.[11] Injecting the commissures addresses down-turning at the corner of the mouth, thus rejuvenating the perioral area.

TECHNIQUE FOR SAFETY IN THE LOWER LIP

When injecting the lower lip, we maintain the same basic tenets as we do for the upper lip. Superficial injections should be performed no deeper than 3 mm at the vermilion-cutaneous junction with a low- or intermediate-G′ filler using linear threading technique.[12,13] To obtain optimal results, many patients benefit from treatment of multiple subunits. This creates a more harmonious appearance, as opposed to a quilted appearance where only a single area is addressed. Using our "U-technique," we inject the commissure in the superficial subcutaneous plane, and then the immediate lateral third of the upper and lower lip (**see Video, Supplemental Digital Content 5**, ***http://links.lww.com/PRS/C136***).

TECHNIQUE FOR SAFETY IN THE NASOLABIAL FOLD

When injecting into the nasolabial fold, use of a cannula should be considered, given the close proximity to the facial artery and its potential location within the subcutaneous tissue. Injection into the deep dermis or superficial subcutaneous tissue should be performed in the inferior two-thirds

Video 6. Supplemental Digital Content 6 demonstrates a technique for safely injecting facial fillers in the nasolabial fold, available in the "Related Videos" section of the full-text article on PRSJournal.com or, for Ovid users, available at ***http://links.lww.com/PRS/C137***.

with an anterograde and retrograde linear threading technique. (**See Video, Supplemental Digital Content 6**, which demonstrates a technique for safely injecting facial fillers in the nasolabial fold, available in the "Related Videos" section of the full-text article on PRSJournal.com or, for Ovid users, available at ***http://links.lww.com/PRS/C137***.) When injecting in the inferior two-thirds, it is best to inject within or just medial to the nasolabial fold. An isolated injection immediately lateral to the fold may actually may make the fold appear deeper and give a more aged appearance. The injection needle or cannula should be in constant motion to decrease the chance of intravascular

Video 7. Supplemental Digital Content 7 demonstrates a technique for safely injecting facial fillers in the nose, available in the "Related Videos" section of the full-text article on PRSJournal.com or, for Ovid users, available at ***http://links.lww.com/PRS/C138***.

injection. In the upper third of the nasolabial fold near the alar base, injection should be performed in the preperiosteal level using depot or bolus technique because the artery can be seen at the subdermal level in this location. An alternative technique would be an intradermal injection. Both techniques decrease the chances of injuring and/or compressing the inferior alar, lateral nasal, facial, and angular arteries at this level.

TECHNIQUE FOR SAFETY IN THE NOSE

When injecting in the nose, injections should be carried out deep to the musculoaponeurotic layers in the preperichondrial and preperiosteal layers to avoid injury or cannulation of vessels. The vasculature in the nose is superficially located beneath dermis. (**See Video, Supplemental Digital Content 7**, which demonstrates a technique for safely injecting facial fillers in the nose, available in the "Related Videos" section of the full-text article on PRSJournal.com or, for Ovid users, available at ***http://links.lww.com/PRS/C138***.) Compression of the dorsal nasal and superiormost portion of the angular arteries is recommended as well. In patients who have had previous rhinoplasties, extreme caution should be used. The anatomical planes may have been violated or scarred, creating distortion. The dermis can be adherent to the framework, leading to a higher chance of intravascular injection; furthermore, the natural anastomoses between the different arcades within the nose may no longer be present. The presence of grafts, and how they contribute to the overall appearance, must be assessed. When injecting the nasal dorsum and radix, we recommend small amounts with serial threading, massaging after each set of injections. Before proceeding with any additional injections within the nose regardless of location, one should always wait 15 minutes to ensure there is no skin compromise and then proceed. For the nasal tip and ala, conservative volumes with a serial puncture technique should be used to prevent extrusion of the filler beyond the tip and/or ala, creating a bulbous nose. Likewise, the more hydrophilic hyaluronic acid fillers may cause delayed swelling after injection, leading to vascular compromise. Along the nasal sidewall, the preferred method is a crosshatching technique to achieve a uniform volume expansion under the thinner skin in this area.[14] One should always inject more than 2 to 3 mm above the alar groove to avoid the lateral nasal artery.[15]

CONCLUSIONS

Facial filler injections continue to grow in popularity given the immediate results and limited recovery. Complications generally arise secondary to vasculature injury and/or cannulation with filler. We have outlined our preferred injection techniques in the facial danger zones with respect to the pertinent anatomy in an attempt to minimize risk and maximize results. Most importantly, the practitioner should be able to recognize complications and address them immediately.

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PATIENT CONSENT

Patients provided written consent for the use of patients' images.

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