

Midface Volumization with Injectable Fillers



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KEYWORDS

- Midface volume • Tear trough deformity • Hyaluronic acid • Calcium hydroxylapatite
- Poly-L-lactic acid • Polymethyl methacrylate • Midface injectable fillers

KEY POINTS

- Aging changes of the midface include loss of bony support, facial lipoatrophy, and descent of soft tissues.
- Restoration of midface volume can be achieved by the use of injectable filling agents.
- The improvement in lower lid and midface volume achieved with the use of filling agents can produce results lasting up to 2 years.
- Injection techniques in this region may vary and can include the use of needles or cannulas for product placement.
- Complications of soft tissue filler injections to the midface are generally mild and self-limiting.

INTRODUCTION

In recent years, our understanding of the changes associated with facial aging has improved. Volume deficit, rather than vertical descent or ptosis alone, is now appreciated as a critical component of facial aging. We understand volume loss in terms of bony remodeling of the craniofacial skeleton, lipoatrophy of the fat pads, and loss of skin and muscle tone.¹ In addition, the skin of the aging face loses volume and elasticity. In the midface and periorbital area, loss of volume results in a number of changes characteristic of the facial aging process. The tear trough and lid–cheek junction become more visible, and the malar region flattens and descends.

Our focus on facial rejuvenation has added the 3-dimensional idea of volume restoration to the traditional 2-dimensional process of surgically repositioning ptotic tissues. Volumizing the midface may

be accomplished with either autologous fat or currently available filling materials. In the early 2000s, new classes of filling agents were developed that proved to be superior to collagen in both effect and duration of results. Many such filling materials have since gained tremendous popularity in the nonsurgical treatment of volume loss seen with facial aging. A number of filler materials, including hyaluronic acid (HA), calcium hydroxylapatite (CaHA), polymethyl methacrylate (PMMA) and poly-L-lactic acid (PLLA), are now available in the United States.²

TREATMENT GOALS

Given our current understanding of the central role of volume loss in facial aging, facial rejuvenation techniques have shifted away from treating wrinkles alone and toward increasing volume while shaping and sculpting the face. Injectable fillers can be used to restore volume and reduce the

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appearance of wrinkles and folds, thereby creating a more youthful appearance. Injectable fillers are especially useful in midface and periorbital rejuvenation, because many of the effects of aging in these areas are owing to volume depletion.

The specific goals of treatment must be ascertained for each individual patient. The selection of filler material and placement, as well as injection technique, must then be tailored for each patient, taking into account the specific anatomic changes observed in that individual, age and medical comorbidities, willingness for downtime, and cost.³

PRETREATMENT ASSESSMENT

The boundaries of the midface are the inferior orbital rim superiorly, the nasal sidewall medially, and the nasolabial fold inferiorly and along the course of the zygomaticus major muscle laterally (**Fig. 1**). Understanding of facial anatomy and of the contributions of different anatomic components to overall facial aging in each specific patient is critical in the selection and use of injection fillers. Careful assessment of each tissue layer of this region is paramount in determining treatments for facial rejuvenation, to obtain natural-looking results.

The lower lids and midface should be analyzed with the patient in a seated and upright position. Attention should be directed toward the degree of skeletonization of the lower lids, degree of orbital fat herniation, midface volume, and soft tissue ptosis. Fillers can be placed in the lower lid and/or the cheek to rejuvenate the midface, similar to the placement of autologous fat.

Lower Lid

The lower lid complex consists of skin, fat, and bone. In the lower lid, the tear trough refers to the

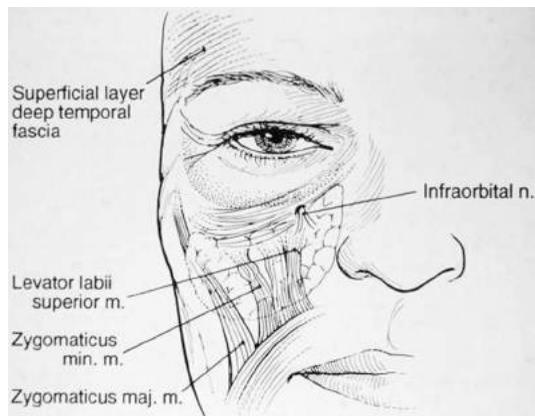


Fig. 1. Anatomy of the midface. (Adapted from Schwarcz RM, Kotlus B. Complications of lower blepharoplasty and midface lifting. *Clin Plast Surg* 2015;42(1):63–71; with permission.)

depression extending from the medial canthus. It separates the lower eyelid from the cheek and is bound superiorly by the orbital fat pad. The tear trough ends approximately at the midpupillary line. Extending laterally from this point is an additional groove called the lid–cheek junction, which is roughly parallel to the infraorbital rim. The muscle components of both the tear trough and lid–cheek junction are fixed to bone; inferior descent of these structures is therefore minimal.⁴ The tear trough and lid–cheek junction instead become more visible with age because of volume loss.⁵ In addition, with aging, the central portion of the orbicularis-retaining ligament becomes more lax, resulting in inferior displacement of the orbital fat pads.⁴ Herniation or pseudoherniation of the fat pad above produces lower lid “bags,” deepens the tear trough, and further accentuates the trough by creating shadowing beneath. The inferior orbital rim becomes skeletonized and these changes produce the tear trough deformity.

The tear trough and lid–cheek junction are also defined by differences between the eyelid and cheek skin. The skin of the lower eyelid is thinner and more pigmented than that of the upper cheek; the upper cheek also has a thicker dermis and more underlying subcutaneous fat. With time, lid skin can become even more pigmented, increasing the contrast between the lid and the upper cheek.⁶

Evaluation of each of these components is critical before proceeding with lower lid volumization with injectable fillers. Ideal candidates have thick skin and are without large orbital fat pads. Patients with significant herniation of orbital fat may instead benefit more from surgery, because fillers alone may not eliminate adequately the transition between the protuberant fat pad and the concave tear trough.^{7,8}

Midface

Evaluation of the midface for volumization should include assessment of both the soft tissue and bony components of the region. Fat in this area exists in several well-defined compartments in superficial and deep layers. With facial aging, there is volume depletion in these compartments. There is also ptosis and migration of the fat compartments.⁹ As volume is lost and tissues descend, the malar bags become prominent owing to the tethering of the zygomaticocutaneous ligament. The skin also becomes ptotic. In addition, bone remodeling of the midface and orbit contributes to the change in appearance of the overlying soft tissues.¹⁰ As a result of these changes, the full “apple cheeks” of youth become deflated. Ideal candidates for midface volume restoration have a

minimal to moderate tear trough deformity and diminished volume in the cheeks, with minimal to moderate soft tissue descent.

PRODUCT SELECTION

Lower Lid

Volume restoration of the tear trough with filler materials is a difficult technique to master and should only be performed by well-trained practitioners. The lower lid region may be particularly difficult to inject, given its thin skin and its proximity to the orbital and malar fat pads. HA products are widely used in this area given their safety profiles, low allergic potential, and relative ease of injection. Furthermore, HA fillers can be dissolved with hyaluronidase, another advantage when treating this unforgiving region of the face.

In one author's opinion (T.K.), only 2 Food and Drug Administration (FDA)-approved HA fillers—Restylane (Galderma Laboratories, Fort Worth, TX) and Belotero (Merz Aesthetics, Greensboro, NC)—are appropriate fillers to use in this region. The thin, syruplike nature of Juvederm combined with the motion of the orbicularis muscle results in pooling of the product over time. Restylane, however, has a more ideal consistency for placement in the lower lids (**Fig. 2**), although superficial placement or migration of the product may result in a bluish hue under the skin (**Fig. 3**). This discoloration is referred to as the Tyndall effect, which is believed to result from the refraction of blue light by the uniformly sized Restylane particles.¹¹ Occasionally, hyaluronidase injections are necessary to correct this deformity by rapid enzymatic degradation of the product.

Belotero, on the other hand, is manufactured by a different process (CPM technology), which creates a polydensified matrix. This produces a product with more uniform particle size than Restylane, which allows it to spread more easily. It may therefore be injected more superficially and is less likely to result in the Tyndall effect (**Fig. 4**).¹¹ Unlike Restylane, Belotero does not have lidocaine

added to the product. Because of its hydrophilic nature, undiluted Belotero can result in significant edema of the lower lids; dilution of the product by the addition of lidocaine just before injection is therefore suggested.

Midface

Volumization of the malar region is technically simple, and a variety of fillers are appropriate for this region. HA, CaHA, PLLA, and PMMA have all been used to augment the midface with good results. However, only 1 filler, the HA product Juvederm Voluma (Allergan, Irvine, CA), has been FDA approved to treat this region.

Hyaluronic acid

HA is a naturally occurring polysaccharide found in the skin, cartilage, synovial joint fluid, and other connective tissues and is identical in structure across all mammalian species.¹² It is an ideal filler because it is biodegradable and nonimmunogenic. There are many HA filler products available; they differ in their degree of cross-linking, gel consistency, and concentration. They have been shown to have good safety profiles and excellent outcomes (**Fig. 5**).²

Injection of HA fillers may be performed using 27- or 30-gauge needles. Alternatively, cannulas may also be used. This author (T.K.) prefers to use an injection of 1% xylocaine with 1:100,000 epinephrine at the needle entry site. The cannula is then inserted through a control hole made with a 25-gauge needle. The product is then feathered in the deep subcutaneous tissue or preperiosteal plane.

Juvederm Voluma is a newer filling material that received FDA approval in late 2013 for midface volumization.¹³ The pivotal study by Jones and Murphy¹⁴ showed it was safe and effective for up to 2 years. The injection technique for Voluma begins with injections in the upper outer quadrant, proceeding inferomedially to give volume to the cheek.

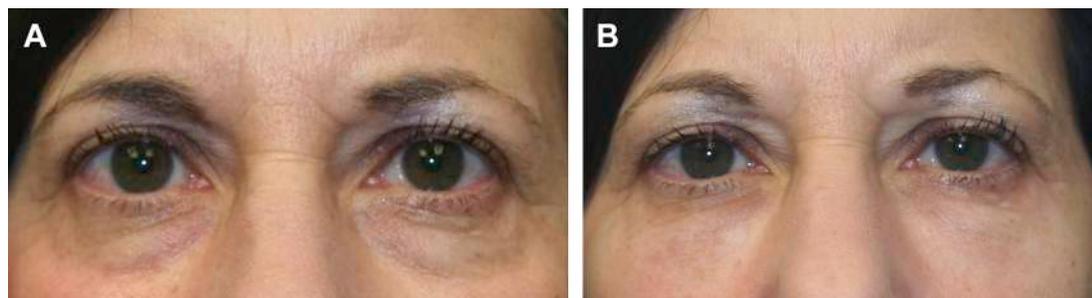


Fig. 2. Before (A) and after (B) injection of Restylane to the tear trough and infraorbital rim.



Fig. 3. Tyndall effect: injected product appears blue when placed too superficially under the skin.

Calcium hydroxylapatite

Radiesse (Merz Aesthetics) is composed of spheres of CaHA in an aqueous gel carrier. Unlike HA, Radiesse works as a volumizer by stimulating production of collagen; the microspheres act as a scaffold for the newly formed collagen. The carrier gel is resorbed within several weeks after injection, and the CaHA itself slowly degrades over time and is excreted by the body. Like HA, CaHA is nonimmunogenic and biodegradable, with a favorable safety profile.² Radiesse works well to fill the midface because it has a high lift capacity and results may persist for about a year (**Fig. 6**).

CaHA can be placed in the midface with either a cannula or a needle, in a manner similar to injection of HA products.¹⁵ Radiesse premixed with lidocaine is not available commercially, although the product received FDA approval in 2009 for the addition of lidocaine before injection. The product should be injected into the subdermal or preperiosteal plane.

Polymethyl methacrylate

PMMA (Artefill, Suneva Medical, San Diego, CA) may also be used for midface volumization. It is a permanent filler and is composed of microspheres of PMMA suspended in a matrix of bovine collagen and lidocaine. After injection, volume is initially provided by the collagen gel. The collagen is resorbed by the body over 1 to 3 months, while the PMMA becomes encapsulated with connective tissue during this time. The PMMA microspheres are not degraded or excreted by the

body; results, therefore, are permanent and cannot be reversed. Despite being a nonabsorbable implant, the safety profile of PMMA is similar to that of HA or CaHA fillers.²

Owing to the bovine-based carrier gel, skin testing must be performed 1 month before injection to rule out an allergic reaction. Injection of the product into the midface may be performed using either a needle or cannula into the subdermal or preperiosteal plane. Care must be taken to place the product symmetrically and to undercorrect.

Poly-L-lactic acid

PLLA (Sculptra, Galderma Laboratories) is another useful product to augment the malar region,¹⁶ which consists of lyophilized crystals of PLLA that must be rehydrated by in the addition of water. PLLA is a synthetic polymer that stimulates collagen production by causing a foreign body reaction and dermal fibrosis. It is biodegradable, although the product may persist for a variable period of time, up to several years.² Injections should be performed over several sessions at 6-week intervals for optimal facial volumization (**Fig. 7**). The product should be placed in the subdermal plane. Patients should be counseled that final results can take months to achieve.

INJECTION PROCEDURE

Before injection of the midface, photographs are taken to highlight the lower lids and cheeks. A three-quarter view of the face shows the contours of the cheeks and outlines the cheek prominence (see **Fig. 7**). Informed consent must be obtained before any injection procedure and should include a discussion of the risks of vascular injury, asymmetry, bruising, lumpiness, and the need for subsequent touch-up treatments.

Lower Lid

Injection of the lower lids should be performed with the patient in an upright position. Per patient and physician preference, topical anesthetic cream



Fig. 4. Before (A) and after (B) injection of Belotero into the lower lids and tear trough. (The patient has also undergone an upper lid blepharoplasty. She initially had Restylane placed, which migrated superficially over several years and the Tyndall deformity resulted. Product was dissolved with hyaluronidase and Belotero placed 2 weeks later.)



Fig. 5. Before (A) and immediately after (B) midface volumization using Juvederm Voluma (1 mL per side).

can be applied to the lower lids before the injection procedure. However, this is not a painful area to inject, and patients often tolerate injection of this area without topical numbing.

Most injectors find that deep injection of HA along the bony orbital rim is the ideal place for injection. Superficial injections increase bruising and risk of the Tyndall effect. Small aliquots (0.1–0.2 mL) are placed and massaged into place. Change in orbital gaze position alters the position of the filling

material, so having the patient open their eyes and look up aids in correct placement.

The use of cannulas has become increasingly common for use in augmenting the tear trough region to lessen the risk of vascular injury. When using a cannula, a “control hole” must first be created in the midcheek region. This author (T.K.) prefers to use a small injection of 1% xylocaine with 1:100,000 epinephrine before creating the entry site with a 25-gauge needle. Using a

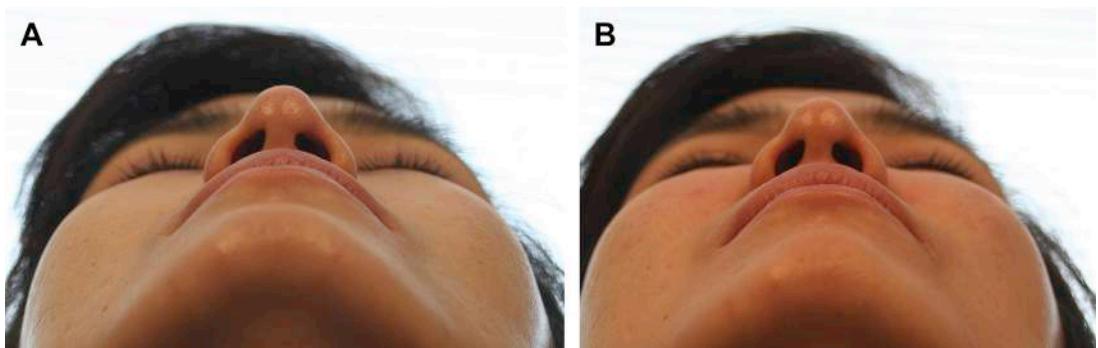


Fig. 6. Before (A) and immediately after (B) midface volumization with 1.5 mL of Radiesse. A flat midface is not uncommon in the Asian population and augmentation in this region can soften the midface.



Fig. 7. Before (A) and after (B) poly-L-lactic acid injections. The patient received a total of 6 vials of Sculptra.

27-gauge cannula inserted through this entry point, filler is placed deeply along the infraorbital rim, in a method not unlike autologous fat placement, and then gently pressed into place to reduce lumpiness and to smooth contours.

Midface

Before the introduction of Juvederm Voluma, practitioners placed fillers (an “off-label” use) in the cheeks and malar prominence in a manner they thought would be aesthetically pleasing. A variety of products including HA,¹⁷ CaHA, PLLA, and occasionally PMMA¹⁸ were placed either transcutaneously or via the buccal sulcus. No reports of increased risk of infection have been published using the transoral route. However, more recent studies of midface volumization with filler materials have added to our understanding of patient assessment and ideal product placement.

Hinderer’s lines were used to delineate the location on maximal cheek prominence (**Fig. 8**).¹⁹ Dr Ulrich Hinderer was a plastic surgeon practicing in Madrid, Spain, who developed silicone malar shell implants for the correction of a flat midface and published his work in 1975. A man before his time, Hinderer expressed surprise that there was

so little attention placed on the zygomatic region. He stated that, because persons are generally viewed in oblique profile and “high cheekbones” contribute to a youthful oval face, augmentation of the zygomatic region would enhance beauty. He described 2 lines: one drawn from the lateral canthus to the lateral oral commissure and the other from the tragus to the nasal ala. The majority of his implant should ideally be placed in the upper-outer quadrant. The Voluma studies defined the quadrants divided by Hinderer’s lines into 3 sub-segments: the zygomaticomalar, anteromedial, and submalar regions.¹⁴

The injection technique in this region has not been well-defined until recently when studies of Juvederm Voluma standardized techniques for this region. Injections are initiated laterally in a depot technique, in a region similar to the location of Hinderer’s malar shell. Filler product is generally placed deeply.

POSTPROCEDURE CARE

Lower Lid

After treatment, patients are asked to use cold compresses on their lower lids for the first day and to refrain from exercise until any bruises resolve.

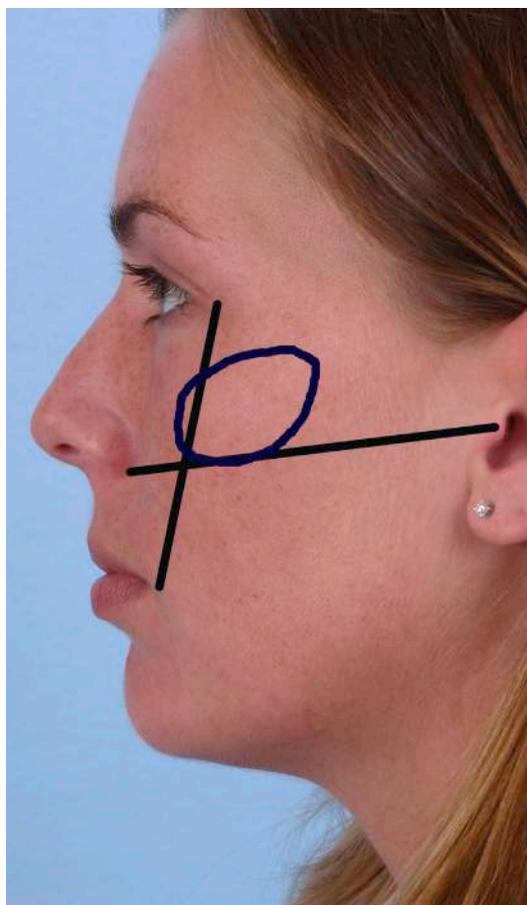


Fig. 8. Hinderer's lines (*black*) define the midface quadrants. The maximal cheek volume lies in the upper-outer or zygomatico-malar region (*blue*) and is the region targeted for volume enhancement of the midface.

Once the swelling subsides, a touch-up treatment may be required, so it is important to reassess these patients in approximately 2 weeks after initial injection. If the patient notes lumpiness, a warm compress should be placed over the lid for 20 minutes while applying firm but gentle pressure. This may help to flatten lumps and minor irregularities.

Midface

Patients who have undergone midface injection with HA, CaHA, and PMMA have very few postinjection sequelae. The use of ice packs aids with any bruising or swelling that develops. For those patients who have undergone PLLA injections, we advise facial massage for 5 minutes a day, 5 times a day, for the next 5 days.

COMPLICATIONS

Complications of filler injections to the face are generally mild and self-resolving. The most common

complications are bruising, edema, and pain or tenderness.²⁰ The use of cold compresses or ice packs may help to reduce these complications. Lumpiness or asymmetry are also possible and may be treated with massage and warm compresses.

Other adverse events include allergic reactions to the filler material, infections, and granulomas. True immunoglobulin E-mediated immune reactions (type I hypersensitivity) are rare. For example, hypersensitivity to HA occurs in approximately 1 in 5000 cases.¹¹ Type I hypersensitivity may result in local or generalized facial edema, which can be treated with antihistamines or oral steroids. Delayed hypersensitivity reactions are also possible and result in induration and erythema days to weeks after injection.²¹ Infection at the site of injection are rare and may be treated with either antibiotics or antivirals, depending on the type of infection.¹¹ Foreign body granulomas may occur with permanent fillers but are uncommon with HA products. These painless nodules typically develop between 6 and 24 months after injection and can persist for years. They are usually effectively treated with intralesional or oral steroids.²²

The most serious complication of injectable fillers is vascular compromise leading to skin necrosis. Vascular compromise may result from direct injury to vessels during injection, external compression of vessels by filler material, or intraluminal injection of product. If vascular injury goes unnoticed or untreated, necrosis of the tissues supplied by the affected vessel may result. The risk of vascular injury may be reduced, but not eliminated, by the use of blunt cannulas instead of needles. The earliest sign of potential vascular compromise is blanching at the site of injection and typically occurs at the time of injection. Further injection should be stopped. The area should then be treated with massage and warm compresses. Topical nitroglycerin paste should also be applied to the region for further vasodilation, and aspirin should be administered. Consider hyaluronidase injections no matter which product was being used. The patient should be closely monitored to assess progress of the injury.²³

Lower Lid

Volume replacement in the lower lids can be challenging for the injector, regardless of their skill level. Bruising, swelling, globe motion, and skin thinness contribute to the difficulty in achieving a perfect result.

As previously noted, a possible complication of lower lid injections is the Tyndall effect, or a bluish hue underneath the skin resulting from refraction of light by HA filler particles. The Tyndall effect is

more likely if filler material is injected too superficially. Injection deep to the orbicularis oculi muscle reduces the risk of discoloration.³ Alternatively, Belotero is less likely to result in the Tyndall effect even when injected superficially owing to its unique polydensified matrix consistency. The Tyndall effect may be treated by dissolving the HA product with hyaluronidase.

Reports of serious complications like blindness have been described with periorbital injections, but such events are extremely rare.²⁴ Injection of filler directly into a distal branch of the ophthalmic artery (including the dorsal nasal artery and angular artery of the nose) can result in retrograde flow of the past the origin of the central retinal artery. Anterograde flow can then propel the filler into the retinal artery, resulting in permanent blindness.²⁵ As with other vascular events, the risk of intraarterial injection is decreased by the use of blunt cannulas. The risk of blindness is also minimized by injecting slowly and with minimal pressure.²⁶

Midface

Complications of midface augmentation are generally mild and self-limiting. The most common complications of filler injections to the malar region include bruising, edema, lumpiness, and asymmetry. There are no major end vessels in this region, so injection of fillers in this area is relatively safe. This author (T.K.) finds the most difficult aspect of malar augmentation with fillers to be obtaining exact symmetry. Because some patients have subtle facial asymmetries, injections must be placed for symmetry and different amounts of filler material may be required from one side to the other.

OUTCOMES

In clinical trials of facial fillers, the nasolabial folds have been the most commonly addressed area of the face.² Many descriptive and qualitative studies have been published that assess the use of fillers for lower lid and midface volumization, but few randomized, controlled trials exist.^{26–28} Given this dearth of clinical trials, commercially available fillers are generally FDA-approved only for the treatment of facial folds and wrinkles, such as the nasolabial folds, or human immunodeficiency virus (HIV)-related facial lipoatrophy. However, injectable fillers are frequently used for volumization of the lower lid and midface regions in an “off-label” fashion.

Only 1 filler available in the United States, Juvederm Voluma, has been granted FDA approval specifically to treat age-related midface volume loss. Juvederm Voluma is an HA gel with a

mixture of low- and high-molecular-weight HA. The first study of Voluma, performed in Europe, was an open-label, nonrandomized trial assessing the safety profile, benefit, and ease of use of the product. Seventy patients across 15 sites were included. Injections were performed primarily in the malar region (59%). Patients were evaluated using the 5-point Facial Volume Loss Scale at baseline and at day 14 after treatment. Patients were also rated on the Global Aesthetic Improvement Scale (GAIS) at day 14. The mean Facial Volume Loss Scale score declined significantly by day 14. Using the GAIS, 88% of physicians and 76% of patients rated their level of improvement as much improved or very much improved. The vast majority of physicians rated Voluma as easy to use. Adverse events occurred in 24 patients and were transient; bruising was the most common adverse event.²⁹

FDA approval was granted for Juvederm Voluma after the completion of a single-blinded, randomized controlled clinical trial of 282 patients with midface volume loss. The no-treatment control group included 47 patients, whereas the study group included 235 patients, who were treated in 1 or more of midface regions. Patients received touch-up treatments as needed at 30 days and were seen again at 1 month, 3 months, and then quarterly for 2 years. The validated 6-point Mid-Face Volume Deficit Scale (MFVDS) was used to assess improvement at 6 months by 2 blinded evaluators. Improvement of 1 point or more on the MFVDS was achieved at 6 months by 85.6% of patients, with a significant difference between the control and treatment groups. On the GAIS, 82.2% of investigators and 92.8% of patients rated midface volume as improved or much improved at 6 months. Minimal adverse events were reported and included injection site tenderness, swelling, firmness, or lumpiness. Most adverse events resolved within 2 weeks or less.¹⁴

An additional open-label trial of Juvederm Voluma has since been completed. In a 24-month Australian trial, 103 patients underwent Voluma injections to the malar region. Subjects were evaluated at week 8, week 78, and month 24 using the MFVDS and GAIS. At week 8, 96% of patients achieved an improvement of 1 point or more on both MFVDS and GAIS ratings. A total of 72 subjects completed the 24-month study; of these, 45 did not require supplementary Voluma at week 78. At the completion of the study, 96% of those 45 patients who had not required touch-up treatments had retained improvement on MFVDS assessment. GAIS evaluation demonstrated continued improvement in 82% and 91% when rated by subjects and physicians, respectively.³⁰

Other HA fillers that have been evaluated for volumization in the midface in open-label trials include Restylane SubQ (Medicis Aesthetics) and Perlane-L (Medicis Aesthetics). Restylane SubQ is a large-particle, stabilized HA gel designed for injection in the subcutaneous and supraperiosteal planes to restore volume loss and define facial contours. A 12-month, open-label study was performed to assess the safety and efficacy of the product for cheek and chin augmentation. Fifty-seven patients underwent injection, for a total of 98 cheeks treated. Patients were evaluated using the GAIS at several intervals up to 12 months. This study did not distinguish between those treated in for cheek versus chin augmentation, but overall patients and investigators noted at least some improvement at treated sites in 91% and 96% at 6 months, respectively. By 12 months, response rates had fallen to 58% and 53% of subjects, respectively. Treatment-related adverse events included local reactions, induration, and implant mobility.¹⁷

Perlane-L is another large-particle HA, premixed with 0.3% lidocaine. Its effectiveness in volumizing and contouring the midface was evaluated in an open-label Canadian study. This 24-week trial included 40 patients who were rated at weeks 8 and 24 using the validated 4-point Medicis Midface Volume Scale and the GAIS. Improvement of at least 1 point on the Medicis Midface Volume Scale was noted in 97.5% and 90.0% at week 8, as rated by blinded evaluators and subjects, respectively. At week 24, continued improvement was noted in 90.0% and 82.5% of subjects, respectively. GAIS assessments showed improvement in 95.0% to 100.0% of subjects throughout the study period. Mild adverse events, including bruising, swelling, and pain, were reported, but had all resolved by week 24.³¹

Several fillers have been studied for their efficacy in treating HIV-related facial lipoatrophy. The use of Radiesse (CaHA) for augmentation in HIV lipoatrophy was examined in an 18-month open-label trial. One hundred subjects underwent injection of Radiesse into the cheek (typically submalar) regions. GAIS assessments demonstrated improvement in 100% of patients at 3 months and in 91% at 18 months. Treatment-related adverse events were generally mild and included bruising, swelling, redness, and pain.³²

Injectable PLLA received FDA approval for treatment of HIV-associated lipoatrophy in 2004. Its efficacy and safety were first investigated in England in a 24-week, open-label, randomized study of 30 patients. Immediate versus delayed treatments were studied. The immediate group received injections into the deep dermis overlying the buccal fat pad on day 1 and weeks 2 and 4, whereas the

delayed group received injections at weeks 12, 14, and 16. Patients were assessed using visual analog scales as well as anxiety and depression scales. At week 12, the immediate treatment group had significantly better visual analog, anxiety, and depression scores than the delayed group; these improvements persisted through the end of the study period. No serious adverse events were reported.³³ These subjects were later reevaluated for long-term safety and efficacy. A sustained improvement in visual analog scales was seen after a minimum of 18 months after last injection. Delayed treatment-related adverse events included nodularity, but were not severe.³⁴

Last, PMMA (Artefill) has been evaluated for safety and efficacy in malar augmentation for age-related lipoatrophy in a 12-month, open-label pilot study in Canada. A total of 24 patients with mild to moderate lipoatrophy underwent injection of Artefill in the supraperiosteal layer of the malar region, with touch-up injections at weeks 4 and 6. GAIS scores demonstrated that 95.8% of subjects were improved or very much improved, and malar lipoatrophy grades were significantly improved from baseline at 1 year after injection. There were no reported adverse events in this study.¹⁸

SUMMARY

The contribution of volume loss to facial aging is now more greatly appreciated, and we now consider the 3-dimensional changes of volume in addition to the 2-dimensional changes of ptosis that we have traditionally associated with aging. Volume loss occurs in all tissue compartments of the face, including skin, muscle, fat, and bone. Over the past decade, the popularity of injectable fillers has grown tremendously. Volumization of the lower lid and midface with fillers is fairly straightforward with few side effects, and it offers a number of advantages over surgical rejuvenation procedures when performed correctly and in the right patient. Clinicians must have knowledge of the available fillers and of facial anatomy, to minimize the risk of complications resulting from injection. Few randomized controlled trials have been conducted evaluating the use of injectable fillers in volumization, but available products have been used safely and effectively in an “off-label” fashion for many years. Many opportunities clearly exist for further research in these areas.

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