Chapter 1

# APPLICATION OF FILLERS

*by*

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## INTRODUCTION

In the last five years, there has been an increased demand in the number of fillers available in the market. This corresponds with the increased demand for less-invasive procedures among consumers. The result is a wide array of choices for the patient and injector to address almost any type of problem. In this chapter, we outline the various applications of fillers throughout the body.

## BACKGROUND

The ideal injectable filler remains elusive to this day. The properties we look for in an ideal injectable filler include safety, ease of use, consistency of results, and longevity of results.

Liquid silicone was the first filler available to treat contour defects, scars, and rhytids of the face. It was widely used for two decades until concerns about long-term safety caused it to fall out of favor.[1,2] Several years ago, a new liquid silicone product was cleared by the FDA and has been used in an "off-label" fashion for cosmetic enhancement of the face. Liquid silicone is a permanent filler.

Bovine collagen was the second available injectable filler and was widely used with a very low incidence of complications.[3] Allergy testing of the skin was necessary with Zyderm and Zyplast. These products lasted for a few months after injection, requiring frequent administration. Over the years, collagen-based products have evolved. Cosmoderm and Cosmoplast (human collagen) eliminated the need for skin testing. Evolence (porcine collagen) is cross-linked, giving it a longer-lasting quality, and it does not require skin testing.

Autologous fat transfer techniques were introduced around the same time as bovine collagen. The safety of an autologous filler cannot be matched by anything synthetic. However, there is an increased morbidity associated with a more invasive type of procedure. Consistent, reproducible results are also an obstacle for some practitioners.

Hyaluronic acid fillers are among the pack of the latest, most widely used nonsurgical cosmetic treatments. Hyaluronic acid products can be derived from animal sources or from bacterial fermentation (see Table 1.1). The various preparations currently available differ in cross-linking and concentration of hyaluronic acid in the carrier vehicle. Although the products are all similar, there are subtle differences that lead each injector to have his or her own

TABLE 1.1. Various Hyaluronic Acid Injectable Filler Preparations

| | |
|---|---|
| Juvederm Ultra<br>Juvederm Ultraplus | Nonanimal Stabilized<br>Hyaluronic Acid (NASHA) |
| Restylane Perlane | NASHA |
| Elevess | NASHA + Lidocaine |
| Hylaform | Animal hyaluronic acid |

preference. Most hyaluronic acid fillers last from four to six months.

Radiesse comprises microspheres of calcium hydroxylapatite suspended in a matrix composed of water, glycerin, and sodium carboxymethylcellulose. This is a bulkier product than those previously mentioned, and it is injected into a deeper plane. The unique viscosity and elasticity of the material make it possible to mold the implant for several minutes after injection, minimizing irregularities in contour. Unlike the previous products, Radiesse has been shown to stimulate new collagen growth in the injected areas. It lasts from eight to twelve months.

Sculptra is a suspension of poly-L-lactic acid in water. Unlike the previously mentioned products, it is not used in a single injection session. To obtain optimal results, multiple injection sessions several weeks apart must be utilized. This product can also induce new collagen growth and has been clinically shown to increase dermal thickness over time, with results lasting for several years.

Artefill is a combination of polymethylmethacrylate (PMMA) spheres and bovine collagen. This product requires skin testing and can last for several years as the bovine collagen is replaced by autologous neo-collagen over time since the PMMA spheres provide a permanent platform.

## BASIC APPROACHES TO INJECTABLE FILLERS

There are two main approaches when it comes to using any type of injectable filler. The first is the microscopic approach – zooming in and concentrating on specific lines, wrinkles, furrows, or scars. The second approach is the macroscopic – pulling back and reconstituting lost volume. It is important to keep both approaches in mind when addressing any given situation since most problems are multifactorial and require a thorough evaluation for effective treatment. Injectable fillers are often combined with other treatment modalities to achieve a global rejuvenation of the skin and soft tissue.

## BASIC INJECTION TECHNIQUES

There are several injection techniques, and each injector has his or her favorite. There are some situations where one technique is preferred over the others due to anatomic constraints or the depth of injection required. The main techniques are serial puncture, linear threading, cross-hatching, fanning, and depot (see Figure 1.1). Although most injectors prefer using transcutaneous injection techniques, there are several transoral injection techniques described.

## ANATOMICAL CONSIDERATIONS

When addressing the face, we like to divide it into upper, middle, and lower thirds. Of course, all three must be balanced to achieve a harmonious, pleasing appearance.

The upper third of the face includes the forehead, glabella, and periorbital areas. Here, the synergistic use of botulinum toxin combined with injectable fillers for the treatment of dynamic rhytids can achieve better results than a single-modality treatment.[4]

Posttraumatic or iatrogenic defects of the forehead and temporal areas can be treated with fillers with great success. In periorbital rejuvenation, volume replacement is the key. Temporal lipoatrophy can be reversed with injectable fillers. Mild brow ptosis can be alleviated with a combination of botulinum toxin and volume augmentation. The naso-jugal crease or

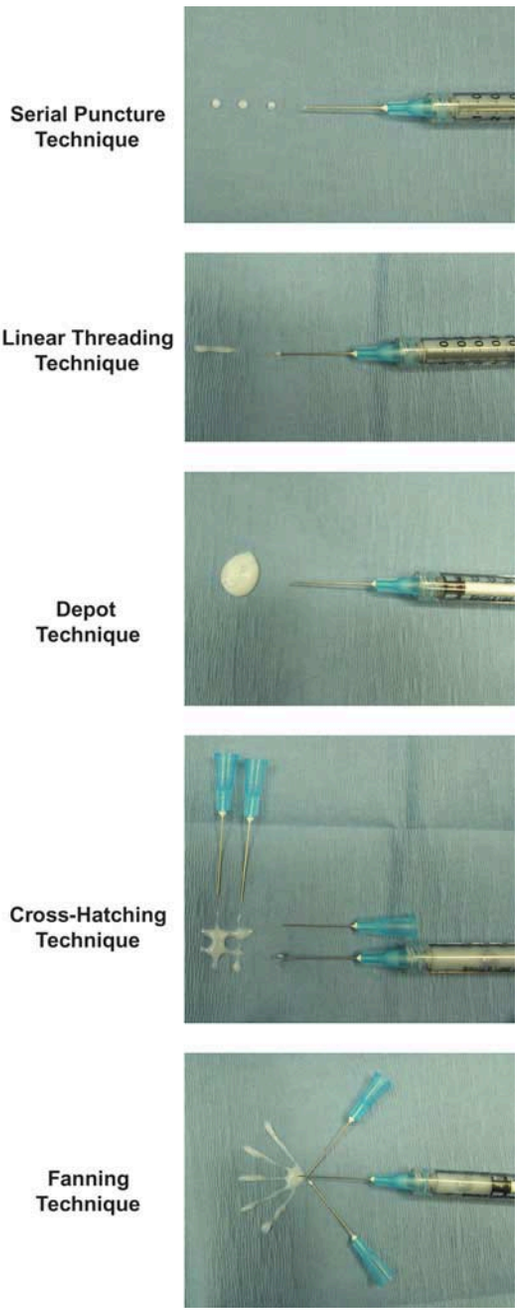


***FIG. 1.1. Various injection techniques: serial puncture, linear threading, depot, cross-hatching, and fanning.***

"tear trough" deformity can be treated with careful injection of filler into this area.

The midface is the most popular area for use of injectable fillers. Soft tissue volume loss is an integral part of the aging process. The nasolabial folds are the most commonly treated area of the face. All of the available injectable fillers have been used in this area with a great deal of success. Treatment of malar and submalar volume loss is also very common when dealing with HIV-associated facial lipoatrophy.[5]

Treatment of posttraumatic or congenital defects of the nose is another area of the midface where injectable fillers can be used to avoid the need for surgical intervention. Scars of the face (especially those due to acne) are most commonly treated in the midface, in the mid-to-lateral cheek areas.

In the lower face, treatment of perioral rhytids is the most common application of injectable fillers. Volume enhancement of the lips is also very common. Other areas that are treated include the jawline and chin, especially the prejowl sulcus.

Off-face use of fillers has grown considerably in the last few years. One of the most common areas of use off the face is for rejuvenation of the hands. Volume replacement of the dorsal hands can be achieved with fillers alone or fillers combined with light-based modalities.

Fillers have also been widely used in postreconstructive nipple enhancement and postliposuction defects anywhere on the body.

## CONCLUSION

There are a myriad of choices when it comes to injectable fillers. The most important aspect of deciding which filler to choose for any particular treatment is the clinical evaluation of the patient. Other considerations, such as the anatomical area being treated, the depth of the injection, and the desired duration of results, can also influence the choice of filler used. Fillers can also be combined with surgical and nonsurgical treatment modalities. With the appropriate assessment of the patient's concerns, several options can be presented, and an informed decision can be made.

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Chapter 2

# APPROACH TO CHOOSING THE IDEAL FILLER

*by*

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## INTRODUCTION

Presently, there is no one ideal filler for all patients, for all indications, and in all situations. It is unlikely that this will ever occur, given the extreme variables in patients and in the goals of aesthetic filler injections. The type of product best for lip injection may not be the best for volumetric cheek filling or for dorsal hand augmentation. The injectable filler best for a young woman with fine skin texture is different than that for an older man with redundant folds or for acne scars. The cost of material, duration of effect, and the social downtime issue all play a role in making the final decision of product choice.

In the end, it is the technical skill of the physician and the familiarity with the product that are the most important factors in the clinical result. This discussion will review the key issues to help the practicing aesthetic physician choose the ideal FDA (Federal Drug Association) approved filler for each patient. Fillers that have not been FDA approved in the United States, autologous fat (an excellent global restorative filler), and silicone (an excellent permanent filler for HIV lipotrophy) will not be discussed here.

## CHARACTERISTICS OF THE IDEAL FILLER

The ideal filler is nonallergenic, durable yet reversible, has a natural look and feel after injection, is able to be injected in off-face areas, and is very safe. It should be easy to inject and should cause only little pain, swelling, or bruising. For purposes of being a good business model for a busy practice, it should be prepackaged in sterile vials or syringes, requiring no mixing, and be reasonably priced to be affordable to the patient for many years since return visits ensure a viable practice. If the product does not require skin testing for allergenicity, patients could be injected at the initial consult, which enhances compliance and improves patient conversion, both important for the practice business model. Smaller needle size for patient comfort, yet with ease of flow to prevent hand fatigue for the physician, would be important for an ideal product.

## POPULAR FILLER OPTIONS

Presently, in the United States, the FDA is the authoritative body that approves aesthetic fillers as medical devices. Studies that show efficacy and safety must be presented. Devices are not required to have such rigorous testing as drugs, but for more than twenty years, only one type of filler, bovine collagen, was FDA approved. Zyderm I, Zyderm II, and the more cross-linked version, Zyplast revolutionized cosmetic dermatology. They were the "gold standard" for fillers for two decades. Human-derived collagen (Cosmoderm, Cosmoplast) followed in 2003, and then, several hyaluronic acid (HA) products received FDA clearance. These included Restylane, Hylaform, Hylaform Plus, Captique, Juvederm Ultra, Juvederm Ultra Plus, Perlane, Elevess, and Prevelle Silk. Currently, only Restylane, Perlane, Juvederm Ultra and Ultra Plus, and Prevelle Silk are sold in the United States.

Poly-L-lactic acid (PLLA: FDA approved Sculptra), calcium hydroxy apatite (CaHA, Radiesse), polymethyl methacrylate (PMMA, Artefill), and a newly approved porcine cross-linked collagen, Evolence, complete the list of available fillers. Presently, the facial lines and folds are approved for injection of HA, collagen products, CaHA, PLLA and PMMA. CaHA and PLLA are approved for HIV-associated face lipoatrophy. No product is FDA approved for lip augmentation, periorbital injection, glabellar, earlobe augmentation, nor for cosmetic volumetric or cheek enhancement. Since these areas, as well as hands, are not cleared by the FDA and yet are commonly injected, most aesthetic filling is done "off-label" under the discretion of the treating physician.

## MAKING THE BEST CHOICE

There are some guidelines that a physician can follow when choosing fillers. The thickness of the patient's skin is one of the first variables that should be considered. Thicker, more robust, structural fillers are better for patients with thicker skin, "sebaceous" skin with redundant folds (Figures 2.1 and 2.2). Such products often require less volume to achieve improvement. The concentration of HA and degree of cross-linking of the HA have been found to be important for the characteristics of the final HA product.[1,2] For those products that are particle sized, a larger particle size may translate to greater lift for thicker skin.

*FIG. 2.1. Sebaceous, thick skin before treatment.*

*FIG. 2.2. Sebaceous, thick skin immediately after 2 cc of Perlane.*

The placement and volume of filler injected affect lift in thicker skin. Layering filler at different depths has a beneficial effect for thicker skin as well. In contrast, finer lines or lines that are etched into the skin have fewer complications when injected with

***FIG. 2.3. Thin delicate skin before treatment.***

thinner fillers (Figures 2.3 and 2.4). Less viscous fillers are less likely to make the skin heavy and result in out-pouching or lumping, which can occur when heavier products are injected into thin lines (Figures 2.5 and 2.6).

Skin color and ethnic skin variations are important considerations when choosing fillers. Non-Caucasian ethnic groups are one of the fastest growing groups of aesthetic patients. These patients with heavily pigmented skin are at risk for postinflammatory hyperpigmentation (PIH). Some fillers have been specifically tested on heavily pigmented skin and have been found to be safe (Figures 2.7 and 2.8).[3]

***FIG. 2.4. Thin delicate skin four months after injecting 0.4 cc of Juvederm Ultra.***

***FIG. 2.5. Superficial injection of Perlane into finely etched perioral lines lateral to the mouth corners.***

Dermatologists who specialize in cosmetic procedures have reported very favorable results with filler use in ethnic skin.[4] Technique changes are important with ethnic skin. Fewer sticks implanted into the skin are singularly important for darker skin because the puncture sites are the most common sites of PIH. More robust fillers, therefore, that give more lift per stick are optimal. In addition, since melanin decreases photoaging, darker skin does not usually require the filling of fine rhytids that respond best to thinner fillers.

Product duration is very important in choosing fillers. More cross-linkage and less free HA concentration have been found to affect duration.[1,2] Particle size has not shown an effect on persistence of correction. Both depth of injection and total volume injected impact duration. Injection of a greater

***FIG. 2.6. Camouflaging the out-pouching with Restylane and Botox.***

*FIG. 2.7. African American before treatment.*

volume of any type of filler to full correction is associated with longer duration of effect. Variables from patient to patient such as the quality of the skin, patient age, and ongoing exposure to the sun have an effect on duration with the same product. Touch-up injections after full correction require less volume and make filler correction more cost effective over time.[5] In one study comparing the duration of CaHA and HA fillers, less product and longer duration seemed to make the CaHA filler relatively preferred when considering this issue.[6] PMMA, PLLA, and CaHA have a collagen-stimulating effect that results in longer correction duration.

*FIG. 2.8. African American two months after injection of 1.6 cc Juvederm Ultra Plus.*

Older skin requires greater volume for correction and has more of an issue with lipoatrophy, so collagen-stimulating fillers are often the better choice. PLLA, approved for folds and wrinkles on July 31, 2009, has found a place in volumetric filling in both older patients and younger patients demonstrating a gaunt appearance from exaggerated facial length as well as from illness or genetically derived low facial fat (Figures 2.9 and 2.10).

The patient's personal preferences are also important considerations. Many patients request "natural" products made of materials found in their bodies. Human collagen and HA, which is identical across species, would likely be their preference. A patient who has been treated with fillers for a number of

*FIG. 2.9. Gaunt face before treatment.*

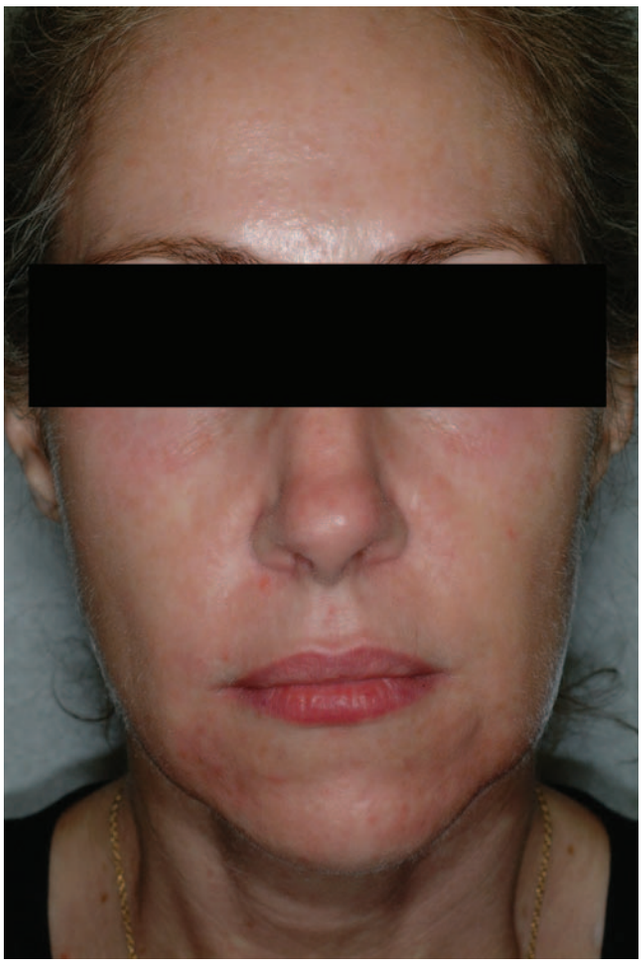

***FIG. 2.10. Four months after a total of 3 vials Sculptra over three sessions.***

years may be interested in a permanent filler such as PMMA or silicone, so he or she may discontinue frequent visits for correction. Others may request a treatment that gives results very gradually over time so as to not reveal to others a dramatic change.[7] PLLA is ideal for that situation. Others like the idea of immediate results with the promise of longevity from collagen stimulation and CaHA is the best choice for these patients.

The ability to reverse the correction if the patient is unhappy is the most compelling reason to use HA fillers for hesitant patients (Figures 2.11 and 2.12). Lip injection can result in unhappy patients if the change is too drastic or if it changes the shape of

***FIG. 2.11. Reaction to Restylane six months after injection of 1 cc.***

the lips. For this reason, many patients prefer a shorter duration product first to try the new lips on for size before continuing on to a product known to have greater duration. The problem of immediate swelling or bruising may impact a patient's product preference. Some physicians have reported definite differences in swelling after lip injection when comparing homogenous gel HA versus particle-sized HA filler.[8] In addition, fillers that are in equilibrium with water before injection will result in a "what you see, is what you get" result with no delayed swelling. Tendency for bruising is another consideration when patients require a "no-downtime" treatment, although bruising is more a function of patient

***FIG. 2.12. Correction of reaction with hyaluronidase one week later.***

propensity, use of aspirin or nonsteroidal medications, fish oil, and vitamin E supplements. Well-designed studies have identified that injection technique, especially slow injection rate, can impact bruising and swelling more than the product choice.[9] Finally, pain and the fear of it are powerful dissuaders. Fillers with added lidocaine are great choices for these patients. Anesthetics are now being added by physicians after manufacturing and there has been no change in the safety effectiveness or duration.[10,11] Fine-gauge needle use is another variable that may affect patient preference. More robust, thicker fillers must be injected with a larger bore needle and may increase the patient's sensation of pain due to the larger bore needle as well as the pressure on tissue from the thicker product.

As mentioned, social downtime considerations must be factored in product choice as human collagen and low-concentration HA are less likely to bruise and swell. This consideration must be weighed with economic issues. Thicker materials and those that stimulate collagen production may be better values in the long run because of superior maintenance of correction.

Within the same patient, there is a need for differing product use. Products such as CaHA, PMMA, and PLLA are poor choices for lip augmentation.

***FIG. 2.13. Before correction.***

***FIG. 2.14. Nine months after injection of total 0.8 cc Juvederm Ultra Plus into the lips, perioral rhytids, and nasolabial fold in a twenty-eight-year-old female.***

Softer and less viscous fillers are better for perioral rhytids and for natural lip augmentation (Figures 2.13 and 2.14).[1,12] The poor vascularity of the glabellar area dictates the need for a less viscous product that can be injected into the upper dermis. Deep dermal injections in this area are considered risky for vascular occlusion and skin necrosis, so large particle-sized HA, CaHA, and PMMA should be avoided. Cheek augmentation does better with a more robust product that can be molded for a natural look. Finally, thicker, collagen-stimulating, structural fillers such as CaHA are good for bound-down acne scars. These types of issues are considered when counseling a patient about filler options.

The author has experience with all these fillers and has formulated opinion to guide the novice injector when it comes to product choice. Some basic fillers with their relative strengths and weaknesses are listed in Table 2.1.

## PRECAUTIONS

One final discussion of great importance is the complication issue. Although all fillers have potential complications, the risks with filler use are low. Temporary, self-limiting side effects such as bruising, lumping, swelling, and asymmetry are well known