Soft Tissue Augmentation

9

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History

There has been a tremendous paradigm shift taking place in plastic surgery toward nonsurgical modalities in facial rejuvenation. This evolution accelerated over the last 5 years owing to the increasing demand from patients desiring less downtime and faster recovery. We have only begun to scratch the surface of what the future holds in less invasive techniques for not only the face but also the rest of the body. History has taught us to be cautious in rapidly introducing agents to fill facial defects. The search for that perfect filler would adequately fill the correct volume, be safe and biocompatible, nonteratogenic, noncarcinogenic, cause no infection, require no skin testing, and fully reversible. From the first filler agent, paraffin, to chemical agents in the early 1800s, to fat transplants in the late 1800s, the search for that perfect filler material was beginning to take shape. In the mid-twentieth century the advent of silicone changed the industry, only to be later banned due to its complications. The 1970s saw bovine collagen as the savior for facial augmentation. It ran a wonderful course until the game changer in 2006 when the FDA approved Hyaluronic acid fillers, which revolutionized the world of nonsurgical facial rejuvenation. Since then many different types of fillers have emerged on the market, and many more are on the horizon. More recently, PRP, or Plasma Rich Protein has taken the market by storm not only as filler, but also as a facial skin enhancer by attracting growth factors and stem cells.

Types of Fillers

There are two broad categories of fillers: Temporary and Permanent.

Some of the more common temporary fillers are **hyaluronic acid**, which includes Juvederm (Allergan, Irvine, CA), Belotero (Merz Aesthetics, San Mateo, CA), and Restylane/Perlane (Medicis Aesthetics, Scottsdale, AZ etc.). The **calcium hydroxyapatite** fillers include Radiesse (Merz Aesthetics, San Mateo, CA), and the **collagen stimulators** include Sculptra (Sanofi Aventis, Bridgewater, NJ). Permanent fillers are not as common as the temporary ones, and include **polymethylmethacrylates** such as Artefill and Artecoll (Suneva Medical, San Diego, CA). Each filler has its unique physical

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properties that lend themselves to specific outcomes in individual patients. It is very important for the injector to understand the unique physical properties of the different types of fillers prior to deciding which filler is best for the patient.

There are two concepts that predict the lifting capacity of fillers: G prime (elasticity) and Viscosity [1]. The G prime or elasticity describes how the filler is able to retain its shape when a force is applied. High G primes allow for more contour stability and lifts tissues better. Fillers with lower G primes are softer and spread through tissues easer. For deeper areas, a higher G prime is a better choice due to the amount of movement and need for contouring. For tear troughs, a lower G prime may be better suited. Another property measured for filler is the viscous nature of the filler. The viscosity is related to the flow of the filler and how spreadable the filler is. A higher viscosity filler is able to keep its shape better while lower viscosity filler will conform to the underlying tissues better.

Hyaluronic Acid

Hyaluronic Acid (HA) fillers are the most popular soft tissue fillers used in the United States. It is a naturally occurring glycosaminoglycan that is a major component of all connective tissue. HA is a non-animal product, so there is no chance for any adverse immunologic reaction, which is why patients don't need pre-injection allergic testing. Hyaluronic acid is very important for skin hydration, so the loss of HA with age can result in reduced dermal thickness, increased skin wrinkling, and folding. One big advantage of hyaluronic acid properties is that it can be reversed within 12–24 h following injection of the enzyme hyaluronidase. For areas where more volume is desired, such as the buccal cheek area, a higher G prime and viscosity product such as Juvederm has shown to be more beneficial. However, in the infraorbital tear trough, a thinner product such as Belotero or Restylane is preferred. If placed too superficially under the eyes, HA can result in a tyndall effect in which the optical scatter of the HA and fluid reflects blue light. Only Belotero, with a cohesive polydensified matrix property, has the least chance of developing a Tyndall effect. Regardless of the product used it is recommended to place the product supraperiosteal in the tear trough to avoid visible contour irregularities (Figs. 9.1, 9.2 and 9.3).

Calcium Hydroxyapatite

Radiesse has calcium hydroxyapatite (CaHA) microspheres suspended in a sodium carboxy methylcellulose gel carrier. It is more effective in

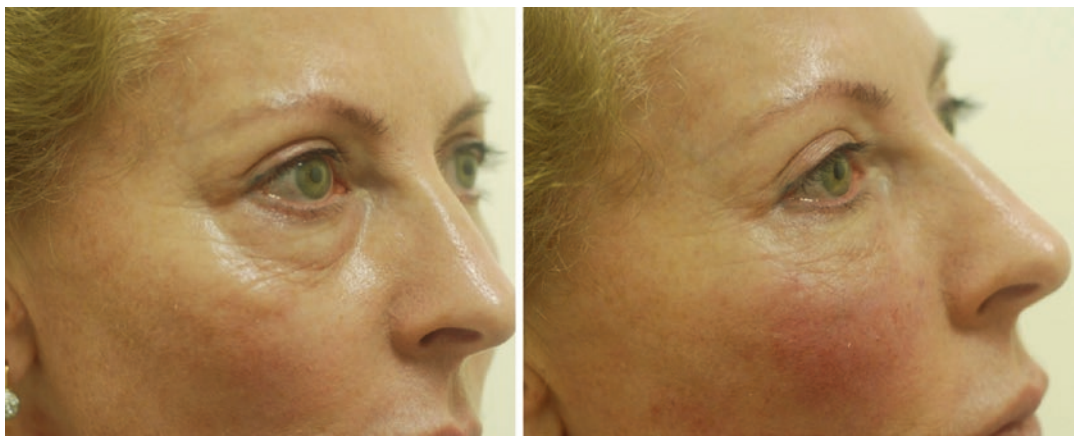

Fig. 9.1 Cannula cheek lift with Juvederm Voluma, cannnula tear trough with Belotero

Fig. 9.2 Cannula tear trough with Restylane

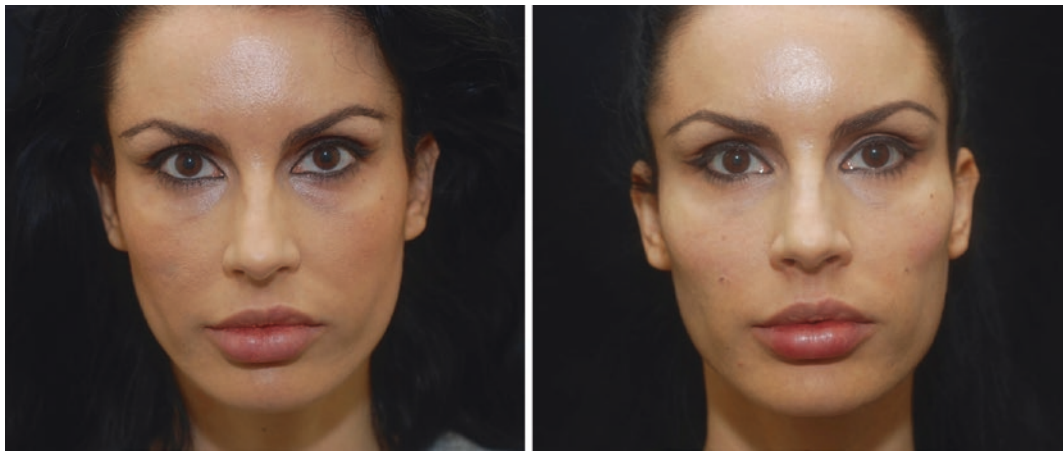

Fig. 9.3 Cannula cheeks lift Radiesse

treating deep lines and furrows. This product can last between 6 and 12 months. It is FDA-approved for the correction of moderate-to-severe facial folds and wrinkles, as well as lipodystrophy. CaHA is wonderful in filling over bony prominences such as the malar area in patients with thicker skin. Placing this filler in the tear trough area is *not* recommended.

Collagen Stimulators

Poly-L-lactic Acid (PLLA) such as Sculptra is a product that stimulates collagen growth and allows for subtle and progressive augmentation. It can cause, rarely, nodules and granulomas. This product is primarily for patients requesting global facial volumization where autologous fat is not available. It can last from 12–18 months following a series of three treatments.

Permanent Fillers

Polymethylmethacrylate (PMMA) is non-resorbable. It has microspheres composed of 3.5% bovine collagen, 0.3% lidocaine hydrochloride, 2.7% phosphate buffer, and 0.9% sodium chloride. Its main indication is the correction of nasolabial folds. Because of its bovine collagen component, patients need skin testing. This filler is not reversible like the HA fillers, and this must therefore be taken into consideration when discussing with patients during the reinjection consultation.

Injection

The use of blunt-tip cannulas instead of needles for injecting fillers is a method utilized by injectors to allow for immediate results with minimal

morbidity (Video 9.1). Using the cannulas, the provider is able to place the fillers deep to avoid the ecchymosis discomfort and edema often associated with treatments that are more superficial. The cannulas also allow the injector to dissect underlying soft tissue to select a precise plane for product placement. One important fact in using a blunt-tipped cannula instead of a sharp needle is that it reduces the chance of inadvertent intravascular injection, which could be disastrous [2]. It should be noted that there is a moderate learning curve to overcome when using the cannulas. Once placed, the filler can then be massaged into place. A blunt-tip cannula requires more injecting force than a needle tip, and the pressure may be discomforting to the patient. Once the correct location and plane for filler placement is identified, the cannula is kept moving back and forth in a fanning fashion during a slow injection. This assists in smooth and even deposition of the product. The level of the injection is predicated on the area and the result desired. Around the eyes and cheeks, the fillers should be placed submuscular/preperiosteal for a nicer, softer contour.

Complications

There is a direct correlation between the speed of injections and the number of complications; it is therefore essential to decrease the speed at all cost. The overall safety profile of soft tissue filler injections is excellent, but complications *can* occur. Minor complications of facial fillers include pain, edema, and erythema. These complications are typically transient and resolve within a week without any sequelae. More serious complications may include scars, infections, granulomas, persistent lumps, visible palsy, vascular occlusion, and blindness. By understanding the anatomy and the materials being injected, it is possible to decrease the probability of a complication and to mitigate the outcome should one occur. Patients are warned to avoid nonsteroidal anti-inflammatory medications, aspirin, vitamin C, and omega supplements. It is recommended to sleep with the treated area elevated for 1–2 nights after injections. Ice to treated areas will reduce swelling/edema and trauma.

If lumps or bumps cannot be massaged away after 7–10 days, it is possible to inject the enzyme hyaluronidase. It is also possible to remove fillers by using a 26-gauge needle or an 11 blade.

Granulomas are more commonly seen with nonhyaluronic acid-based products such as silicone, poly-L-lactic acid, and polymethylmethacrylate. The microspheres they produce can be extremely difficult to treat. Treatment with hyaluronidase, collagenase, and steroids has helped these granulomas. In some cases, surgical removal is a viable option. When the granulomas undergo delayed inflammation, treatment with oral antibiotics may help. Vascular compromise is dangerous and has a 0.05% chance of happening [3]. Injection in the temporal fossa should be done at the periosteal plane to avoid injury to the superficial temporal artery. Injections into the forehead should be in the deep planes to avoid the superficial vessels. The glabellar area is a danger zone. Any filler must be superficially injected to avoid vascular occlusion and necrosis of the supraorbital and supratrochlear arteries. Other danger zones include the angular artery at the base of the nasal labial fold and the superficial labial artery at the corner of the mouth. Rarely, reactivation of herpetic eruptions and localized bacterial infection may occur in susceptible patients. These patients should be promptly and aggressively treated with antivirals and local wound care. Any early skin blanching or dusky or purple color must be considered to be impending skin necrosis until proven otherwise. This complication has been reported in association with all types of filler, with an estimated incidence of 0.001% [4].

Intravascular injection of filler agents may lead to embolic events with irreversible loss of vision or cerebrovascular injury [5]. The mechanism of this adverse event is the retrograde propulsion of injected material into the ophthalmic or retinal arteries via the supratrochlear, angular, or dorsal nasal arteries during glabellar or nasolabial area injections, followed by arterial occlusion. Any patient who experiences a decline in visual acuity or ocular pain after injection

should be considered to have experienced this complication until proven otherwise. Immediate ophthalmologic evaluation with a retina specialist and brain MRI are indicated. Theoretically, treatments should be aimed at rapidly reducing intraocular pressure in order to dislodge the embolus to a more downstream location. Aspiration prior to injection should be practiced to rule out intravascular placement of the needle or cannula. Blunt, flexible needles and cannulas are preferred to their sharp counterparts. Importantly, the volume of filler injection should be limited, the pace of the injection should be slow, and the pressure used to inject the substance should be low.

Summary

The introduction of nonsurgical modalities for facial rejuvenation has allowed for less downtime, less morbidity and faster recovery for patients. Filler augmentation is one modality, which has changed the way surgeons approach volume loss. It is very important for the injector to not only understand facial anatomy in detail, but also to understand the dynamics and properties of the different types of fillers available. Appreciating their characteristics and the injection techniques are critical factors in the avoidance of serious complications. Above all, as with any procedure, discussion with the patient of all the risks and complications of filler augmentation should occur during the preinjection consultation.

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