Tri-Site Bolus® Technique for a long-lasting cheek and lower eyelid lift using deep large volume hyaluronic acid injections

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The upper cheek and lower eyelid region is an important reference area for determining the youthfulness of a face. With the onset of the aging process, some of the first telltale signs of senescence can be detected in the midface region. In the past, this has been a difficult area to rejuvenate, and has been neglected by aesthetic surgeons. The classic facelift does not address this region; and lower lid blepharoplasties, although they may remove the protruding fat pads, do not restore the loss of cheek fat or the youthful projection.[1] The latter procedure may actually create a more hollow appearance to the area.

More recently, suborbicularis oculi fat (SOOF) lift blepharoplasty or SMAS division midface lift techniques have improved midface aging.[2] Other techniques have included buccal fat pad pedicle flap, repositioning of orbital fat, lipoinjections and cheek implants.[1,3,4,5] Attempts have been made to inject small volumes of hyaluronic acid (HA) into the tear trough region to soften this area. More recently, deeper injections of HA using larger gel particles double the size of Perlane (Medicis) called Restylane Sub-Q (Medicis), have been injected through a 16 gauge needle. The duration of the latter product is generally 6–12 months.[6]

The author wishes to report on a novel technique called the Tri-Site Bolus®. Using this technique with commercially available HA gels and a 27 gauge needle, one is able to raise, soften or eliminate the tear trough; sculpt the cheeks to restore a youthful projection; and in many cases, eliminate the need for a lower lid blepharoplasty by creating a natural continuum between the lower eyelid and cheek.

Rather than using the feathering or microdroplet technique, the material is injected perpendicular to the skin as a confined bolus, into the deep subcutaneous tissue or supraperiosteal region, to create deep deposits in three specific sites, forming support structures, or pylons. (Figure). These HA pylons create a suspension bridge that lift the tissues superiorly and restore the projection anteriorly in the midface region. Using HA, 1–5 syringes are injected per side, depending on the degree of atrophy. Over 6 years of durability have been documented using this technique.

Patients and Methods
Over 600 patients have been treated using the Tri-Site Bolus® technique, their ages varying from 21–85 years. Initially the patients were injected with Perlane® (Medicis) and Juvederm™ 30 (Ultra-Plus), and more recently with Teoxane's Teosyal® Ultra Deep.

Technique
The patient is seated erect for the procedure, at eye level with the injector. A low volume infra-orbital nerve block using 0.1 mL Xylocaine® without adrenaline is injected; in smaller cases no anesthetic is used. Small volume anesthesia is utilized to maintain the normal anatomy of the tissue and to minimize any distortion from the anesthesia. Adrenaline is not used since the resulting vasoconstrictive ring is distracting when evaluating this region.

Pre-injection pressure is applied with the injector's fingers in the mid-cheek area, lightly pushing up the tissue to demonstrate the expected improvement to the patient, and to determine the approximate number of syringes required. With experience, one is able to estimate, usually within one syringe, the required amount (Figure). Many patients are not aware of the aging changes in the midface, so this demonstration helps them to understand and see the importance of a full cheek and minimal or absent tear trough.

The needle is inserted at a 90 degree angle to the skin surface at three specific sites into the deep subcutaneous tissue or supraperiosteal region. The needle remains in a stationary position during the injection; the other hand is placed on the patient's face to control migration of the material. The material is injected very slowly from the syringe. It often takes 2–3 minutes to empty the entire syringe in one location, creating a deep non-visible subcutaneous deposit. There is no massaging of the tissue unless too much material has been injected. The degree of atrophy determines the amount of material required. Intuitively this technique would not seem to make sense in this region. However, using the correct type of HA, injection technique, and selecting the appropriate site, visible nodule formation rarely occurs.

One is able to sculpt the region by using an average of 1–5 syringes per side. This rebuilds the cheek and zygomatic area, and softens or often removes lower eyelid bags by eliminating the transition between the cheek and lower eyelid. The tear trough area is also improved and raised to a higher position or eliminated. In large volume cases there is often a softening and improvement of the nasolabial groove as the tissue is lifted by the volumetric expansion of the cheek.

The first injection is usually around the infra-orbital nerve location, the next in the zygomatic area, and the last in the medial nasal-jugal sulcus area. Typically one or more full syringes are emptied into the first area. After a critical amount of material has been injected in the midline, there is a sudden lift of the tear trough which is ablated or softened. In many cases where a lower lid blepharoplasty would have been done, the Tri-Site Bolus® technique has eliminated the need for this procedure. After the needle is

removed, gentle pressure is held on the areas to minimize bleeding. In some cases the same bolus technique may be used in the lower cheek area to harmonize the results.

Side Effects

Post-injection swelling and bruising is the most common side effect. To date, one patient has had persistent post-inflammatory hyperpigmentation secondary to hemosiderin from extensive bruising. One patient had unilateral lymphoedema of one lower lid that resolved after 2 months. Theoretically, intravascular injection or nerve damage remains a possibility; however, according to a consensus of oculoplastic surgeons, there is such good collateral circulation in this area that necrosis of the tissue is very unlikely (JF Faure, personal communication).

Each case must be examined individually to determine the precise site of injection and the quantity of material to be injected in each site. Excessive material injected at the medial site in patients with small noses or prominent perinasal malar areas may result in a "broken nose" appearance. Over-correction can always be treated by heavy massaging or hyaluronidase injections.

Discussion

Midface aging is characterized by several features, notably soft tissue ptsosis, loss of cheek projection, mid-cheek crease, tear trough formation, deepening of the nasal labial lines, and lower eyelid bags. Most normal-weight individuals will have some visible degree of these changes present by the age of forty.

A number of processes occur in the midface, which result in an aged appearance. One of the first changes to appear is a subtle ptosis and/or atrophy of the malar fat pad. The pad tends to drift down in a medial-inferior projection, often deepening the nasal-labial groove.[2] As a result, another groove appears, referred to as a mid-cheek fold. It is angled at about 45 degrees laterally at its lower pole across the upper mid-cheek (Figure). As the upper cheek pad is displaced, the tear trough, or nasal-jugal deformity, begins to develop. The tear trough is an upwardly curved horizontal depression following the lower orbital rim. The orbitomalar ligaments, which fix or attach the skin to the inferior orbital rim, accentuate this deformity.[4]

Prolapsed orbital fat may become more visible as the malar fat pad descends, and creates this step-down deformity. Several etiologies have been proposed for the prolapse of the orbital fat. The first is a weakness of the orbital septum that allows the fat to visibly protrude. The second theory is that Lockwood's suspensory ligament, which maintains the position of the eyeball, stretches with time to cause a downward and posterior prolapse of the eyeball. Since the posterior and lateral wall of the orbit can not stretch, lowering the space between the globe and the floor of the orbit causes the orbital fat to protrude forward or anteriorly.[4,7,8]

Over the past 5 years a greater importance has been directed to midface rejuvenation. The classic facelift vectors tend to pull the skin in a more lateral pattern, which does not correct the displacement or volume loss of the midface region. Newer procedures, such as the SOOF lift or SMAS division midface lift, help to improve aging of the lower lid associated with a tear trough deformity. Coleman (reference his text) also introduced a technique of lipoinjection to rejuvenate this area. It requires liposuction for the donor fat and centrifugation, followed by injections through a relatively large canula; this often results in extensive bruising and swelling. Implants and pedicle flaps have also been used. The Tri-Site Bolus® technique offers more finesse and control of the desired fill.

HA gels have now been used in Canada for about 9 years. They have essentially replaced the use of collagen as temporary filler substances. They are either obtained from animal or bacteria sources.[9] The viscoelastic properties of HA make them suitable for injectable fillers. The material is catabolized by naturally occurring hyaluronidase and free radicals.[9] Modifications have been made to obtain material that is mechanically and chemically robust, notably against enzymatic actions. A process called reticulation, which modifies the HA, increases the duration of the product *in vivo*. The more reticulation present, the longer the product will persist. Non-reticulated HA products are used in mesotherapy (this term is not to be confused with the same term used in North America referring to injections to dissolve fat), a technique which is more popular in Europe.[10] These products are often mixed with polyvitamins, antiradicals, and vasodilators and are injected in the skin for supposed rejuvenation rather than as fillers.

The injection of HA is typically in the dermis although new products are being developed for deeper placement. Past dictum has been that injection into deeper tissues results in a rapid degradation of the product. This may be so when using the standard microdroplet or threading technique, in contrast to the bolus technique. There are scant publications in the literature in regards to the longevity of these products, since there are many variables, such as type of HA, technique, volume, level of injection, and site.[9] The usual time frame generally quoted is about 12–16 months. There have been reports however, of unwanted Restylane® nodules lasting over 5 years in the periocular region.[11]

Two patient cases led to the development of the Tri-Site Bolus® technique. In April 2001, the patient in Figure 1 presented with the complaint of a sagging face, mainly due to fat atrophy. The Coleman technique of fat injection was suggested as the superior technique for correction. The patient insisted on the use of HA fillers (Perlane®), even after hearing that the use of this product in these sites would show significant reabsorption in less than one year.

Using the above-described Tri-Site Bolus® technique, a series of deep deposits of Perlane® were injected into the subcutaneous fat of the cheeks using a total of 12 syringes (0.7 mL/syringe). As indicated, there was a stop line where the material was not feathered. With the patient's weight remaining the same as at pretreatment, there was no loss of material and the stop line was still visible over 6 years later. The patient in Figure 3 was inadvertently overtreated in the nasolabial region with Perlane®, which remained in

the tissues for 5 years. This prominence disappeared after one injection with hyaluronidase.

These findings led to the development of the deep bolus injection technique in the midface region to correct the tear trough deformity and loss of tissue, and to soften the distinction between lower lid fat prolapse and the cheek. By gradually increasing the volume of the material used, and eventually using three sites, the Tri-Site Bolus® technique has evolved to become the author's preferred technique for correction of aging of the midface.

The amount of HA injected varies according to the individual. The advantage of using HA with the Tri-Site Bolus® technique over some of the newer agents is that the volume that one sees is what one gets. This eliminates some of the guesswork and decreases the learning curve. Some of the newer non-HA agents depend on gradual stimulation of tissue growth, somewhat like silicone. Over- or underestimating the material required does not generally occur with the Tri-Site Bolus® technique.

Filling these areas can soften, raise or eliminate the tear trough, and by creating a continuum between the cheek and the lower eyelid, the visibility of fat prolapse present in many cases is reduced. This technique has replaced the need for a lower lid blepharoplasty in many patients and avoids the hollow appearance that can be seen when doing a lower lid blepharoplasty. Views from the lateral projection demonstrate the forward projection of the cheeks and a more youthful appearance (Figure).

The explanation for the durability of HA when placed as a bolus in the subcutaneous fat is unknown. The material is intentionally injected to keep it concentrated as a nodule, and not dispersed. With this technique there may be less surface area available for degradation by enzymes when compared to the feathering technique. Alternatively, the body may try to wall off a large inert mass in contrast to small microdrops or cylinders. Biopsy of the Restylane® nodules that lasted 5 years showed a fibrotic capsule surrounding the HA. In some instances, one is able to create a semi-permanent, or perhaps permanent, filler using the Tri-Site Bolus® technique. Injection technique may be critical to the longevity of the correction.[12]

It is paramount that one chooses the right type of HA. The best and most durable products used so far have been Teosyal®, Perlane® and Juvederm™ 30. These products are more viscous and require relatively firm pressure on the plunger to extrude the material, especially Teosyal. Products which flow easily from the syringe, such as Restylane® or Juvederm™ HV, are unable to give the lift required and seem to have a shorter longevity (personal observation). The increased noncross-linked materials in these latter products allow them to flow more freely from the syringe. It may also facilitate migration in the tissue, which decreases the bolus formation and may diminish the durability and lift capabilities.

Less than 3% of patients treated have requested touch-ups in the midface areas after 2–3 years post injection. The amount added has been minimal and is often unnecessary,

except for patient requests for a more exaggerated projection, as commonly seen with lip injections.

Recently the author has utilized this technique on a patient suffering from festoons, or malar bags (Figure). This condition, which is notoriously difficult to treat, responded dramatically to the Tri-Site Bolus® technique.[13,14] Nine syringes were used in the malar area, and a subsequent four other syringes were injected to soften the nasal labial lines. This is the first reported case utilizing this technique which usually requires suspension and resection of the pendulous skin.

In many cases, results using this technique can be spectacular, depending on the canvas. The procedure requires some artistic skills as the injection has to be customized to each individual. A personal comfort level can be developed by starting with small amounts of material. It must be emphasized that this is a procedure to be used by experienced injectors. One is able to show immediate results with long duration and minimal or no downtime.

The important factors for success depend on the correct placement; viscosity and type of HA; control of flow and migration; and the correct volume. The technique of three specific injection sites, slow injection, and large volume is the key to success and duration. When patients are shown before and after photographs and the improvement is demonstrated by the technique shown in Figure , despite the large number of syringes used and their cost, the majority of prospective patients undertake this procedure. Considering the comparable long-term costs and often minimal results seen with many of the new non-ablative and tightening machines now available, the inherent value, efficacy, immediacy and durability of the Tri-Site Bolus® technique becomes readily apparent.

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