Managing Eyelid Malpositions With Hyaluronic Acid Gel Injections

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Upper and lower eyelid malpositions can result from a variety of etiologies including congenital anomalies, involutional changes, postsurgical, and posttraumatic sequelae. These malpositions can manifest in the upper and/or lower eyelid in a variety of ways depending in large part on which of the eyelid lamellae are affected. Surgical interventions have been the mainstays of treatment with few other options. Recently a growing body of literature has reported success with nonsurgical techniques utilizing hyaluronic acid gel (HAG) injections for a variety of eyelid malpositions.[1–8] HAG injections have several distinct advantages over surgery: they allow for precise placement and control, and provide the surgeon with the ability to fine-tune results with repeated injections; they allow for a flexible approach in patients whose underlying problem may be changing or evolving over time; and they are reversible with hyaluronidase. In addition, HAG injections are easily performed in the office setting, providing an alternative to patients who decline surgery or are poor surgical candidates.

Upper Eyelid

Lagophthalmos

Upper eyelid etiologies of lagophthalmos include a variety of paralytic and cicatricial causes. The most common etiology is arguably paralytic orbicularis weakness secondary to zygomatic branch facial nerve weakness. The treatment is often surgical when conservative lubrication therapies fail. Surgical interventions include temporizing static measures such as tarsorrhaphy and dynamic procedures such as muscle transfer reanimation, silicone encircling bands, and springs. Eyelid-loading techniques, however, are by far the most frequently used surgical approach in the form of eyelid weights, typically gold. Nonsurgical HAG injection in the form

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of a "hyaluronic acid gel gold weight" has been described and used with success.[2]

Technique Topical EMLA cream (a eutectic mixture of lidocaine and prilocaine) is applied over the upper eyelid skin and adequate time for anesthesia allowed. Using a 30-G needle, HAG is injected in small amounts through multiple small puncture sites across the length of the upper eyelid. A layered approach with multiple fine, threadlike injections (10 to 20 per eyelid) deep to the orbicularis oculi muscle is used and HAG is placed in the pretarsal and/or prelevator aponeurosis regions until the desired degree of closure is achieved[2] (Fig. 1A).

The HAG filler mechanically weights the upper eyelid similar to a gold weight–type mechanism of action (Fig. 1B). Advantages include nonsurgical in office placement, ability to adjust the amount of "weight" with subsequent injections, and perhaps most importantly the ability to enzymatically remove the material with hyaluronidase injection that is particularly useful in cases of spontaneous return of function, as can occur with Bell palsy.

Retraction

Upper eyelid retraction can result from a variety of etiologies and can often contribute to lagophthalmos. The most common etiologies include thyroid eye disease, postsurgical, and posttraumatic changes. The underlying pathophysiology varies depending on the etiology.

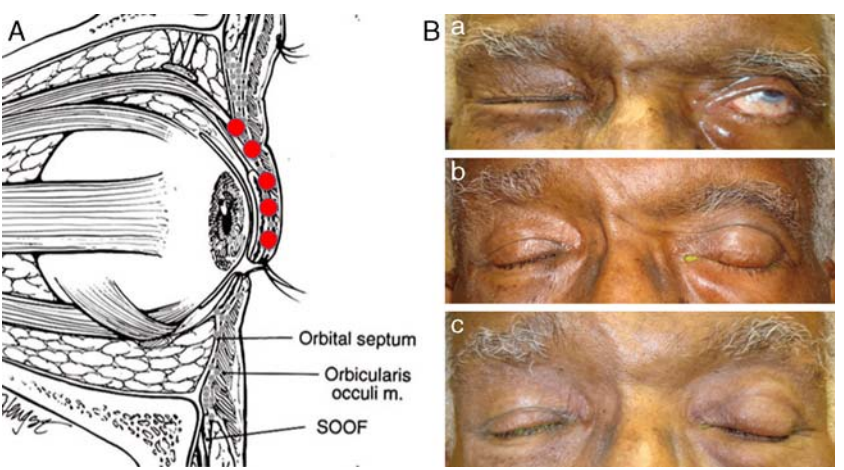

Figure 1. *A, Hyaluronic acid gel (HAG) filler placement deep to the orbicularis oculi muscle in the pretarsal and prelevator aponeurosis regions (circles denote filler location). B, Ninety-year-old patient with left paralytic lagophthalmos who underwent HAG injection in left upper eyelid. a, Preinjection; b, postinjection; c, at 5 months follow-up. Note resolution of lagophthalmos. From Mancini et al.*[2]

Thyroid eye disease typically results in fibrosis of the eyelid and retraction when serologic euthyroidism has been achieved. Postsurgical and posttraumatic etiologies can result from scarring and fibrosis of the eyelid lamellae, particularly the middle lamellar plane, orbicularis oculi weakness, or a combination thereof. HAG injections provide a non-surgical option to address retraction of diverse etiology.[1,3]

Technique The conjunctiva is anesthetized with topical agents. The upper eyelid is everted, exposing the conjunctiva just superior to the superior border of the tarsus. Using a 30-G needle, a single bolus of HAG is placed centrally in the levator aponeurosis plane (Fig. 2A). Small volumes, 0.1 to 0.2 mL, of material are injected with the end point being adequate lowering with improved symmetry. This can usually be achieved with 1 to 2 injections in a single session[1,3] (Figs. 2B, C).

There is a dual mechanism hypothesis for the technique's immediate efficacy in improving upper eyelid retraction. Similar to the mechanism described above, HAG acts as an upper eyelid load, or "HAG goldweight." Secondly, the HAG filler physically stents and inhibits the action of the levator muscle when injected into the levator aponeurosis plane. The combination of these 2 mechanisms results in upper eyelid lowering.[1] Results are immediate, and complications infrequent, prompting high subjective patient satisfaction. The technique affords the surgeon the capability to dynamically and precisely fine tune upper eyelid position in cases where these goals may be difficult to achieve with surgery, such as in the multioperated eyelid. In addition, the technique provides a reversible option for retraction in cases where eyelid position may be dynamically changing, as in cases of inflammatory active phase thyroid eye disease.

■ Lower Eyelid

Retraction

Lower eyelid retraction is most accurately defined as inferior displacement of the lower eyelid, often resulting in scleral show, without malposition of the eyelid margin. The underlying mechanism of the retraction is scarring and relative volume contracture in the middle lamellar plane. Lower eyelid retraction most commonly occurs secondary to postblepharoplasty middle lamellar scarring, typically secondary to orbital septum violation. Thyroid eye disease can also result in lower eyelid retraction, similar to thyroid eye disease–related upper eyelid retraction described above; however, fibrosis is most prominent in the middle lamellar plane. Surgery is often required to improve the lower eyelid position and techniques revolve around middle lamellar scar lysis and often grafting in an effort to stent and vertically augment the eyelid. Shorr and Fallor has described the "Madame Butterfly technique" that utilizes midface lifting and

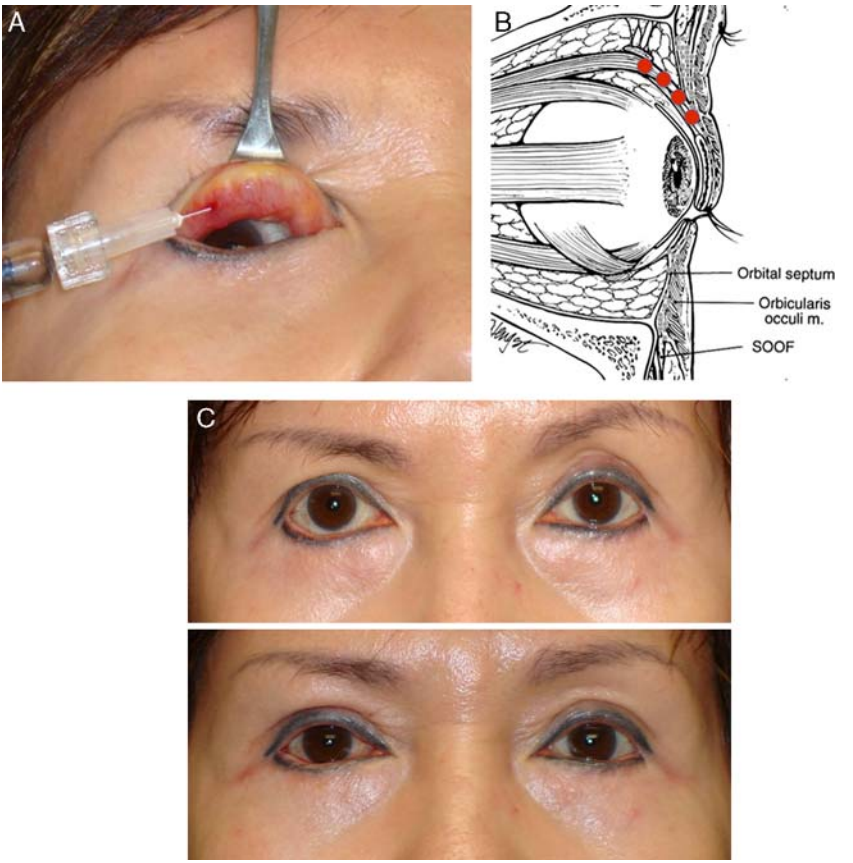

Figure 2. *A, The upper eyelid is everted, exposing the conjunctiva just superior to the superior border of the tarsus. B, Hyaluronic acid gel filler placement in the levator aponeurosis plane (circles denote filler location). C, Before and immediately after injection of the bilateral upper eyelids, note improvement in upper eyelid margin position with less retraction (note lower eyelids have been injected as well).*

hard palate or alloderm posterior and middle lamellar grafts to address severe retraction where full-thickness vertical eyelid inadequacy is present.[9,10] Goldberg eloquently describes a closed en glove technique that is efficacious in improving lower eyelid retraction secondary to middle lamellar scarring and contraction when the anterior and posterior lamellae are intact, thus proving his theory that lower eyelid retraction is primarily a volume collapse phenomenon occurring in the middle lamellar plane.[11] HAG has also been efficaciously used to address lower eyelid retraction.[3–5,7]

Technique Topical EMLA cream is applied over the eyelid skin and adequate time for anesthesia allowed. Using a 30-G needle, HAG is injected in small amounts through multiple small puncture sites across the

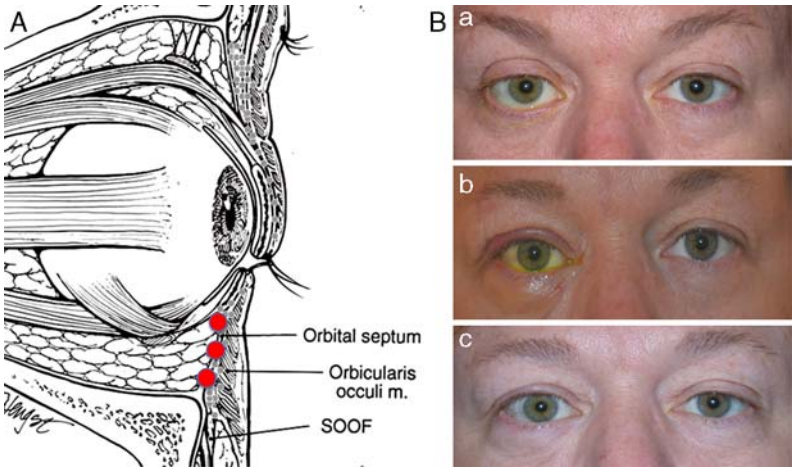

Figure 3. *A, Hyaluronic acid gel filler placement deep to the orbicularis oculi muscle, in the middle lamellar plane, from the inferior border of the tarsus to the orbital rim (circles denote filler location). B, Forty-seven-year-old thyroid eye disease patient with right lower eyelid retraction status-post prior attempted retraction repair with alloderm grafting. a, Before injection; b, immediately after injection; c, 3 months after injection. Note improved lower eyelid margin position (upper eyelid ptosis repair surgery performed concurrently).*

length of the lower eyelid. A layered approach with multiple fine, threadlike injections (10 to 20 per eyelid) placed deep to the orbicularis oculi muscle, in the middle lamellar plane, from the inferior border of the tarsus to the region of the orbital rim, and is injected until the desired degree of lower eyelid elevation is achieved[3–5] (Figs. 3A, B).

HAG lower eyelid injection improves lower eyelid position by vertically augmenting and stenting the lower eyelid and volumetrically expands the collapsed middle lamellar scar plane. The author has found cases where single injection improvements are long standing, possibly secondary to tissue remodeling by a tissue expansion–type mechanism (unpublished data), however prospective studies are needed. Potential advantages include those mentioned above, in addition avoidance of surgery in these often multioperated eyelids is advantageous in avoiding further scar formation and eyelid dysfunction.

Ectropion

Ectropion can result from a variety of etiologies thatultimately result in eyelid margin position instability and loss of the tarsal corneal interface. Involutional and paralytic causes often have a predominant horizontal laxity component and most commonly require horizontal tightening–type procedures. HAG utilized in these cases can produce modest improvements, however, increasing volumes can worsen the margin malposition as the material weights an already horizontally unstable eyelid. Cicatricial

ectropion secondary to anterior lamellar shortage often requires surgical intervention to reestablish the anterior lamellar vertical height, often in the form of full-thickness skin grafting. HAG has been described to improve ectropion secondary to cicatricial etiologies.[3,6]

Technique The technique is similar to that described above for lower eyelid retraction, however the injection is in the immediate suborbicularis occuli plane anterior to the tarsus and orbital septum (Figs. 4A, B).

The mechanism of action is similar to that described above for lower eyelid retraction. HAG injection improves lower eyelid position by vertically augmenting and stenting the lower eyelid, in this case the anterior lamella, equalizing the relative vertical height of the anterior and posterior lamellae, thereby improving margin position. Tissue remodeling using a tissue expansion–type mechanism can theoretically result in long-term improvements.

■ Congenital Eyelid Malpositions

Congenital eyelid malpositions are rare but can have significant functional and aesthetic consequences. These malpositions can include ectropion secondary to anterior lamellar inadequacy, eyelid retraction with secondary lagophthalmos, and epiblepharon. Treatments are surgical in nature when conservative therapies fail. Early surgery has numerous drawbacks including the risks of anesthesia and the difficulties with

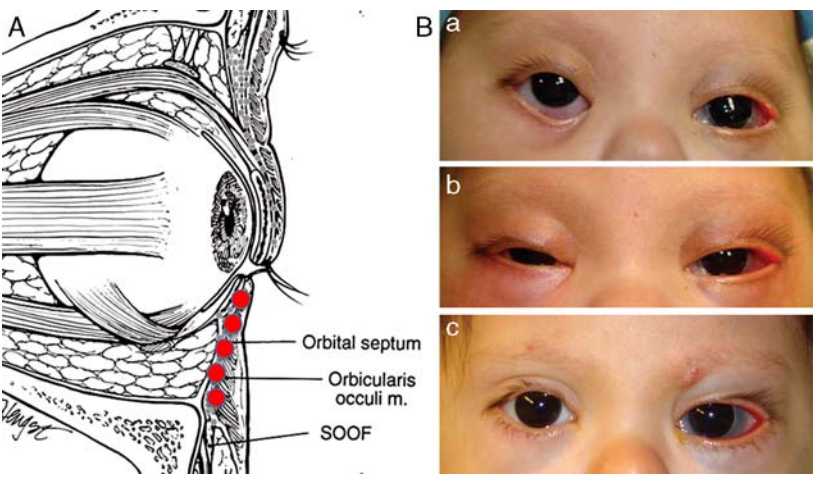

Figure 4. *A, Hyaluronic acid gel (HAG) filler placement in the immediate suborbicularis occuli plane anterior to the tarsus and orbital septum (circles denote filler location). B, Two-month-old male with Down syndrome and lower eyelid retraction, right greater than left, who underwent HAG injection of the lower eyelids. a, Preinjection; b, immediate postinjection; c, 18-month follow-up with continued improvement in lower eyelid position. From Taban and Mancini.*[3]

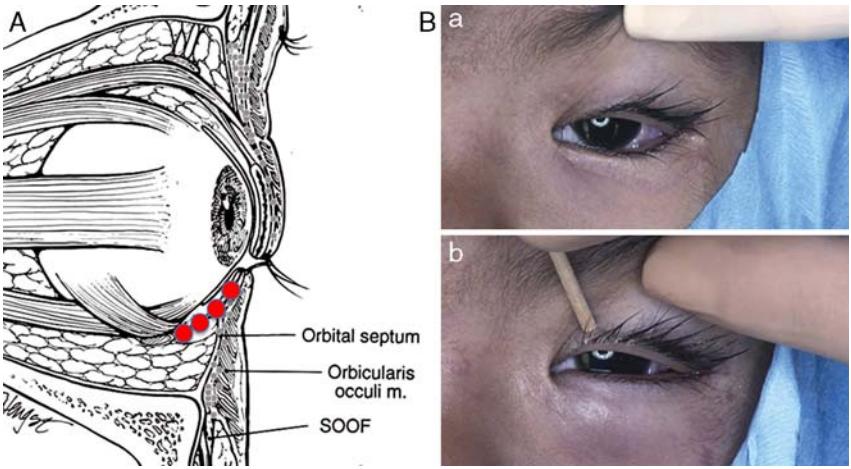

Figure 5. *A, Hyaluronic acid gel (HAG) filler placement in the plane of the lower eyelid retractors (circles denote filler location). B, Twenty three-month-old male with epiblepharon received HAG injection in the plane of lower eyelid retractors. a, Preinjection; b, immediate postinjection with resolution of epiblepharon and corneal lash touch. From Taban and Mancini.*[3]

postsurgical care of reconstructed eyelids in young patients. Taban et al[3] has described the use of HAG to successfully manage this difficult subset of patients in a nonsurgical, reversible manner. Management of upper and/or lower eyelid retraction is as described above. Epiblepharon was treated successfully with HAG in this patient cohort as well. HAG is injected in the plane of the lower eyelid retractors, with the goal of rotating the eyelid margin and lashes away from the corneal surface (Figs. 5A, B). Epiblepharon can be viewed as a discrepancy between anterior and posterior lamellar vertical height, with a relative abundance of anterior lamella. The gel acts as a posterior lamellar stent, vertically augmenting the posterior lamella, and thereby equalizing the relative vertical height of the posterior and anterior lamella resulting in improved margin position.

■ Aesthetic Eyelid Malpositions

Subtle upper eyelid margin asymmetry can impact overall facial symmetry and aesthetics. Addressing these asymmetries can significantly improve facial harmony and complement other aesthetic facial procedures. Margin asymmetries are typically addressed with surgery, either lifting/ptosis repair–type surgeries, or lowering/retraction repair–type surgeries. HAG has been utilized to address subtle upper eyelid margin asymmetries in cases of relative retraction to lower an upper eyelid and improve symmetry.[1] Alternatively, botulinum toxin can be utilized to subtly raise a relatively ptotic eyelid by weakening the orbicularis oculi muscle. A combination of the 2 approaches has been described as well.[1,12]

Technique

The technique is similar to that described above for upper eyelid retraction, however smaller volumes are typically utilized to achieve lowering and improved symmetry.

The technique affords many of the advantages noted above. For the aesthetic, detailed oriented patient, the technique offers the ability to precisely fine-tune results with either repeated injections or hyaluronidase reversal in cases of overcorrection. A subset of patients with subtle degrees of asymmetric involutional ptosis will prefer the appearance of the ptotic eyelid and defer aesthetic ptosis correction. In these patients, lowering of the higher "retracted" eyelid can nonsurgically improve symmetry. In addition, this technique can result in subtle elevation of the ptotic eyelid via a Herring-type effect, whereby increased muscle innervation and drive in response to the filler load can result in increased contralateral innervation and elevation of the ptotic eyelid[1] (Fig. 6).

■ Discussion

Hyaluronic acid, a natural component of the extracellular matrix, has been commercially available for soft-tissue augmentation in Canada and Europe since 1997, and was approved for use by the US Food and Drug Administration in December 2003.[13] In addition to its cosmetic use in filling facial rhytids, HAG has had expanding applications in the

Figure 6. *A, Patient with left upper eyelid subtle involutional ptosis which was his preferred side. B, Six months after hyaluronic acid gel injection of the right upper eyelid with improved symmetry of the upper eyelids secondary to subtle lowering of the right upper eyelid and elevation of the left upper eyelid secondary to a Herring-type effect. From Mancini et al.[1]*

functional arena. HAG has shown utility in addressing a variety of eyelid malpositions.

The use of HAG for correction of a variety of eyelid malpositions offers a number of advantages when compared with traditional surgical approaches: nonsurgical approaches in general offer a safer alternative to patients who are poor surgical candidates or who are medically unstable and at risk from anesthesia; the temporary effect and reversibility of HAG fillers offers the ability to temporarily adjust eyelid position, allowing for a flexible approach in patients whose underlying problem may be evolving over time; a temporary, minimally invasive approach may be particularly attractive for patients who prefer a less invasive alternative and are not dissuaded by the concept of outpatient maintenance procedures; injections can be repeated in a stepwise manner and additional layers may be injected as needed, providing the surgeon with the ability to fine-tune the placement of HAG to attain an optimal result; avoidance of surgery in multioperated eyelids can reduce the risk of worsening malpositions, particularly in cases where a significant degree of preexisting orbicularis or zygomatic branch weakness is present from prior surgery.

Managing eyelid malpositions with HAG injections is not without risk, and the body of literature describing complications continues to grow as the techniques become more popular. In the author's experience over a 5-year period complications from periocular injections have been minor and include: temporary erythema, edema, and ecchymosis at the injection site; contour irregularities; prolonged fluid accumulation; and bluish discoloration (Tyndall effect). When the latter occur they can necessitate enzymatic dissolution with hyaluronidase. More severe complications, including cutaneous hypersensitivity reactions,[14] vascular occlusions including branch retinal artery occlusion and vision loss,[15] infections including biofilm–type processes[16] have been described in the literature but are considered rare.

Overall, HAG injections when utilized in the periocular region offer a relatively safe, efficacious alternative to traditional surgical interventions for a variety of eyelid malpositions.

The authors declare that they have no conflicts of interest to disclose.

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