Nonsurgical Management of Congenital Eyelid Malpositions Using Hyaluronic Acid Gel

Mehryar Taban, M.D.†, Ronald Mancini, M.D.*†, Tanuj Nakra, M.D.*†, Federico G. Velez, M.D.†‡, Noa Ela-Dalman, M.D.†, Angelo Tsirbas, M.D.*†, Raymond S. Douglas, M.D., Ph.D.*†, and Robert A. Goldberg, M.D.*†*

**Division of Orbital and Ophthalmic Plastic and Reconstructive Surgery and †Department of Ophthalmology, Jules Stein Eye Institute, David Geffen School of Medicine at UCLA; and ‡Division of Pediatric Ophthalmology and Strabismus, Olive View-UCLA Medical Center, Sylmar, Los Angeles, California, U.S.A.*

Purpose: To report our preliminary experience using hyaluronic acid gel fillers as a nonsurgical alternative in the management of congenital eyelid malpositions.

Methods: In this retrospective interventional case series, 5 patients (10 eyes) with congenital eyelid malpositions, including eyelid retraction, ectropion, euryblepharon, epiblepharon, and abnormalities associated with a shallow orbit, with resultant lagophthalmos and/or keratopathy and tearing were evaluated before and after injection with hyaluronic acid gel (Restylane) in the pretarsal and/or septal regions of the affected eyelid(s). Pretreatment, posttreatment, and follow-up photographs were analyzed for eyelid position and degree of eyelid closure and lagophthalmos, and slit-lamp evaluation of the degree of keratopathy.

Results: All 5 patients demonstrated significant improvement of eyelid position and degree of keratopathy. The mean improvement in lagophthalmos was 4.5 mm (range, 2–7 mm). The average volume of hyaluronic acid gel used was 0.5 ml per eyelid. Complications were minor, including transient edema and ecchymosis at the sites of injection. Of the 10 eyelids injected, only one had increased astigmatism after injection.

Conclusions: Hyaluronic acid gel shows promise as a safe and effective nonsurgical treatment for the management of certain eyelid malpositions, disorders traditionally requiring surgical intervention if aggressive ocular lubrication fails. This treatment is particularly useful in such patients who are commonly premature with poor general health and serves as a temporizing measure by allowing the much needed tissue expansion to take effect over time.

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Congenital eyelid and orbit malpositions, including ectropion and eyelid retraction, are rare but with often significant functional and cosmetic consequences. Congenital ectropion is a rare congenital deformity, with shortage of skin in all 4 eyelids, sometimes in addition to a degree of ptosis.

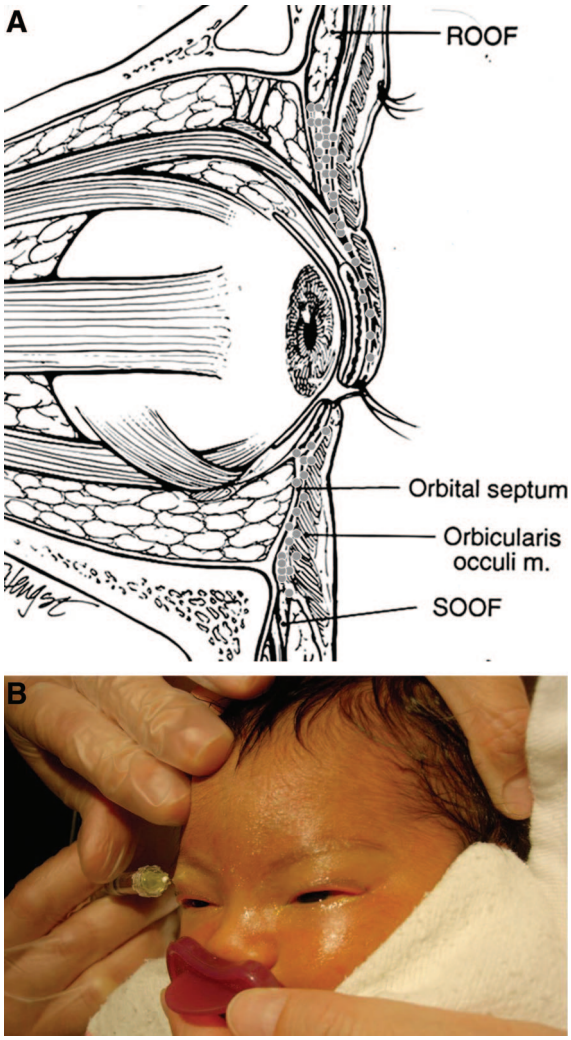

FIG. 1. **A,** Schematic diagram demonstrating the pretarsal and prelevator aponeurosis injections of hyaluronic acid gel for upper eyelid loading and tissue expansion in patient 1 and suborbicularis and subcutaneous injection sites with hyaluronic acid gel (for midlamellar stenting and tissue expansion of lower eyelids) in patients 2 and 3. (Modified from *Ophthal Plast Reconstr Surg* 2009;25:23–6.) **B,** Intraoperative image of a pretarsal and prelevator aponeurosis injection of hyaluronic acid gel.

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Mechryar Taban and Ronald Mancini contributed equally to authorship.
Robert Goldberg is a medical consultant to Medicis.
Address correspondence and reprint requests to Robert A. Goldberg, M.D., Jules Stein Eye Institute, 100 Stein Plaza, Los Angeles, CA 90095, U.S.A. E-mail: goldberg@jsei.ucla.edu

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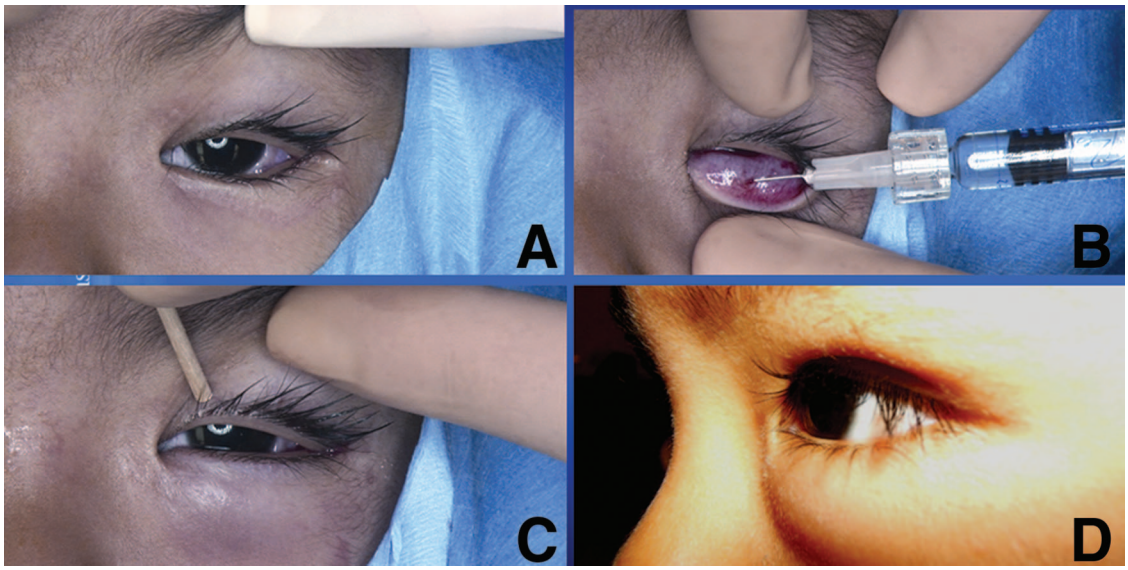

FIG. 2. (Patient 5 in Table) A 23-month-old boy with esotropia and epiblepharon received hyaluronic acid gel injection in the plane of lower eyelid retractors while also undergoing strabismus surgery. **A,** Preinjection; **B,** injection in the plane of lower eyelid retractors; **C,** immediate postinjection; and **D,** 7 months postinjection, with eyelids open. Note the rotation of the lower eyelid margin and lashes.

Euryblepharon is distinguished by an enlargement of the horizontal palpebral fissure associated with enlarged eyelids. Congenital eyelid retractions affect either the lower or the upper eyelid; they are often associated with craniofacial syndromes such as Crouzon syndrome.

Traditional management has included medical therapy (lubricants, bandage contact lens, taping of eyelids) with risk of inducing amblyopia and invasive surgical approaches, including lateral tarsorrhaphy, myocutaneous advancement of the cheek and eyelids, and/or full-thickness skin graft to the affected eyelid(s), with poor cosmesis and long recovery time.[1,2] Surgical procedures are invasive, possess a higher risk of complications, and may result in contraction with additional damage to eyelid lamellae and fibrosis, necessitating further surgeries over time. In addition, there are significant difficulties in the postoperative management of young patients, especially given developmental delay. The indication for such early surgical intervention depends on the importance of the abnormality, its evolution, and the calculated risks compared with those for a delayed surgery. In some cases, delayed surgery (planned toward the end of the growing period) is more appropriate.

In this study, we describe a nonsurgical treatment alternative for congenital eyelid malpositions, including eyelid retraction, ectropion, euryblepharon, and abnormalities associated with a shallow orbit, using hyaluronic acid gel filler. It offers the capability to adjust the position of the eyelid and add necessary volume, maximizing functional capacity while averting the risks of surgical intervention with faster recovery.

Patient characteristics

Patient no./ gender/ age	History	Side	Hyaluronic acid gel type/volume injected per side (ml)	Lagophthalmos, preinjection (mm) R/L	Lagophthalmos, immediate postinjection (mm) R/L	Lagophthalmos, at longest follow-up (mm) R/L	Longest follow-up (months)	Repeat injection, time (months)	Complications (other than transient edema, erythema)	Refractive changes
1/F/2 days	Down syndrome, congenital upper eyelid ectropion and retraction	B	RS/0.5	6/7	0/0	0/0	22	No	None	No
2/M/16 months	Crouzon syndrome, shallow orbits, lagophthalmos	B	RS/0.2	4/5	1/1	N/A	N/A	Yes (3 days)	None	No
	who underwent second injection 3 days after first	B	RS/0.3, 2 days later	1/1	0/0	0/0	6	No	None	No
3/M/2 months	Down syndrome, lower eyelid retractions	B		3/2	0/0	0/0	18	No	None	No
4/F/19 months	Craniosysnostosis, epiblepharon	B	0.3	N/A	N/A	N/A	6	No	None	Yes (one side)
5/M/23 months	Epiblepharon, esotropia	B	0.3	N/A	N/A	N/A	7	No	None	No

M, male; F, female; R, right; L, left; B, bilateral; RS, restylane; N/A, not applicable.

METHODS

After obtaining permission from the institutional review board, a retrospective study was conducted on all patients with congenital eyelid malpositions treated with hyaluronic acid gel (Restylane, Medicis, Scottsdale, AZ, U.S.A.) presenting to our clinic from January 1, 2007, to December 31, 2007. All patients had a preinjection eye examination, including cycloplegic refraction, performed by a pediatric ophthalmologist.

Patient demographics and the type of eyelid malposition were recorded. The amount of lagophthalmos was obtained from the patient charts. Portable slit-lamp examination was performed to evaluate the degree of keratopathy. The amount and location of injected hyaluronic acid gel were recorded. Patients with other orbital or eyelid procedures that may have affected the outcome during the follow-up period were excluded from the study.

Pretreatment, posttreatment, and follow-up photographs were obtained, with focus on the position of the upper and lower eyelids. All photographs were obtained using a standardized technique in the frontal position with the eyelids open and closed and facial muscles relaxed. The technique of using photographs for comparison of eyelid position measurements has been established in previous studies.[3] ImageJ was used for photographic analysis.

Technique of Expansion/Reinforcement of the Upper/Lower Eyelid With Hyaluronic Acid Gel. A similar injection technique has been described previously.[4] Injections were performed under sedation or under general anesthesia, if combined with other surgery; one patient underwent concurrent lateral rectus surgery for preexisting strabismus. If under sedation only, topical EMLA cream (lidocaine + prilocaine) was initially applied over the upper or lower eyelid skin. Using a 30-gauge needle, hyaluronic acid gel was injected in small amounts via multiple small puncture sites across the length of the upper or lower eyelid, avoiding the area adjacent to the canaliculi (Fig. 1). A layered approach with multiple fine, threadlike injections (10–20 per eyelid) deep to the orbicularis oculi muscle was used to avoid superficial or excessive deposition of gel in any single area. Hyaluronic acid gel was placed in the pretarsal and/or prelevator/septal regions until the preferred endpoint: improvement of lagophthalmos without occluding the visual axis. For cases of epiblepharon, the gel was placed in the plane of the lower eyelid retractors, with the goal of rotating the eyelid margin and lashes in a normal orientation (Fig. 2); the gel acts as a stent (or spacer), thereby stretching the posterior lamella and helping to evert the eyelid.

RESULTS

A total of 10 eyelids (5 patients; mean age 12 months; range, 2 days to 23 months) with congenital eyelid malpositions were treated with hyaluronic acid gel to achieve tissue expansion and mechanical lowering/elevation of the eyelids. Patient characteristics are presented in the Table. Significant medical history included developmental delay, Down syndrome, craniosynostosis, and Crouzon syndrome. The type of eyelid malposition included upper eyelid ectropion/retraction with euryblepharon (1 patient, 2 eyelids), lower eyelid retraction (1 patient, 2 eyelids), shallow orbit–related eyelid abnormality (1 patient, 2 eyelids), and epiblepharon (2 patients, 4 eyelids). The indications were keratopathy or impending keratopathy with lagophthalmos. The average amount of hyaluronic acid gel injected in each eyelid was 0.4 ml (range, 0.3–0.5 ml). One patient with residual lagophthalmos underwent a second injection at day 3 of follow-up for optimal outcome (Fig. 3). The volume used in each case was customized based on specific anatomy, severity of lagophthalmos, presence of residual hyaluronic acid gel from a previous injection, and overall aesthetic outcome. Procedures were performed in the clinic, at bedside (neonatal intensive care unit), or in the operating room.

All patients demonstrated significant improvement with resolution in lagophthalmos and/or keratopathy immediately after treatment.

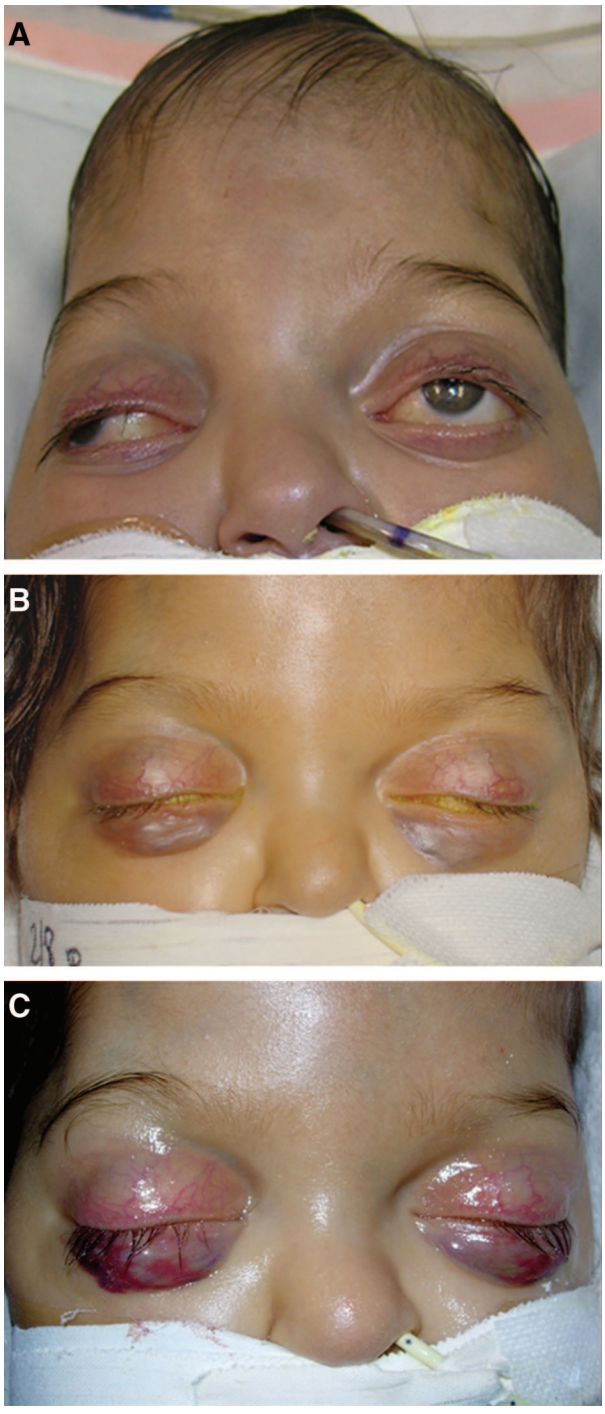

FIG. 3. (Patient 2 in Table) A 16-month-old boy with Crouzon syndrome with shallow orbits and relatively prominent globes with significant lagophthalmos and corneal exposure who underwent 2 injections of hyaluronic acid gel in each lower eyelid over 3 days. **A,** Preinjection; **B,** immediate postinjection 1; **C,** immediate postinjection 2 with eyelids closed.

The mean improvement in lagophthalmos was 4.5 mm (range, 2–7 mm). The benefit persisted in all cases at the follow-up visits (mean 11.8 months; range, 6–22 months). Complications were minor and included transient ecchymosis, edema, contour irregularities, and tenderness at the sites of injection. Overall, there was a nonstatistically

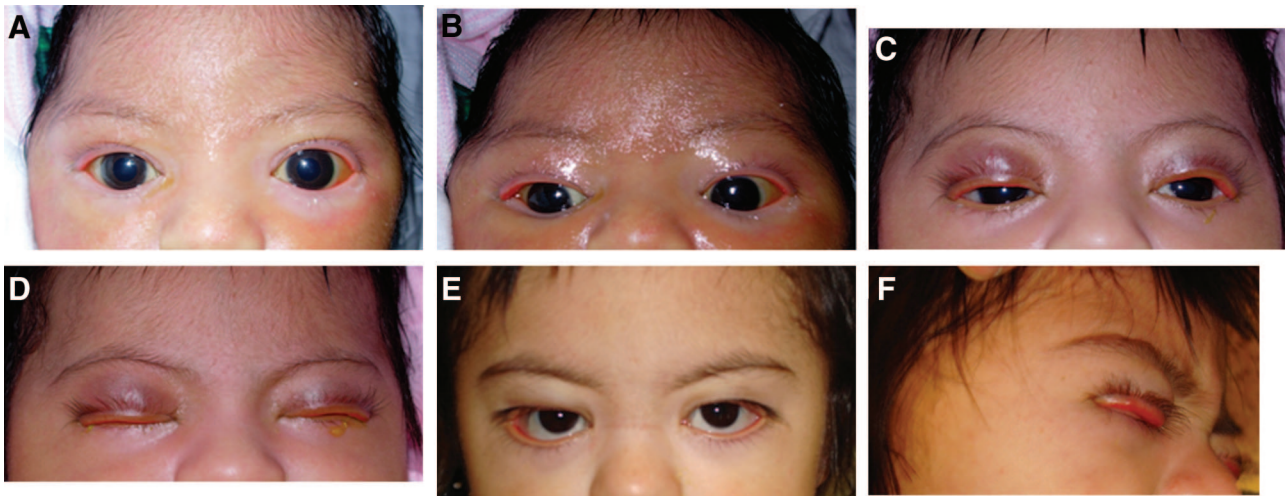

FIG. 4. (Patient 1 in Table) A 2-day-old (gestational age 28 weeks) girl with Down syndrome and pronounced anterior lamellar inadequacy and upper eyelid ectropion with significant lagophthalmos and corneal exposure, injected with hyaluronic acid gel in the upper eyelids. **A,** Preinjection open eyelids; **B,** preinjection closed eyelids; **C,** 1 month postinjection open; **D,** 1 month postinjection closed; **E,** 22 months postinjection open; **F,** 22 months postinjection closed. Note good eyelid contour and clear visual axis with resolution of lagophthalmos.

significant decrease in margin reflex distance 1 and/or margin reflex distance 2, without obstruction of the visual axis. There were no vision-threatening complications from periorbital injections. One patient had increased astigmatism on one side (2.00 diopters with the rule) after treatment. Subjective parent/guardian satisfaction was very high in all cases. Pre- and posttreatment images are presented in Figures 2 to 5.

DISCUSSION

Injectable tissue fillers may provide an alternative to invasive surgical procedures. Cross-linked hyaluronic acid gel has been commercially available for soft-tissue augmentation in Canada and Europe since 1997 and was approved for use by the U.S. Food and Drug Administration in December 2003.[5] In addition to its cosmetic use in filling facial rhytids, hyaluronic acid gel has had expanding functional applications including treatment of glottal insufficiency and unilateral vocal paralysis,[6] orbital volume augmentation for correcting enophthalmos,[7] treatment of incontinence,[8] and in treating lower eyelid retraction with scleral show.[9] The authors have also had success in treating paralytic lagophthalmos by loading the upper eyelid with hyaluronic acid gel.[10] In the periorbital region, the hyaluronic acid gel is expected to last about a year.[9]

In this pilot study, we found expansion and reinforcement of the affected eyelid with hyaluronic acid gel to be an effective nonsurgical treatment modality for a variety of congenital eyelid malpositions, with no significant morbidity. These are conditions traditionally requiring surgical intervention if aggressive ocular lubrication, or even patching, failed. Moreover, the risk of amblyopia is minimized, which can occur when constant ocular lubrication and eyelid taping are applied. All patients in our study had significant improvement or resolution of lagophthalmos and associated keratopathy. The improvement in eyelid position was comparable or superior to results obtained by surgical methods with much lower morbidity and better cosmesis. All patients had significant improvement in exposure symptoms and reduction or cessation of ocular lubrication requirements. The subjective patient (guardian) satisfaction was very high.

The use of hyaluronic acid gel for correction of congenital eyelid malpositions offers a number of advantages when compared with surgery. Such patients are commonly premature and of poor general health, with higher risk if undergoing

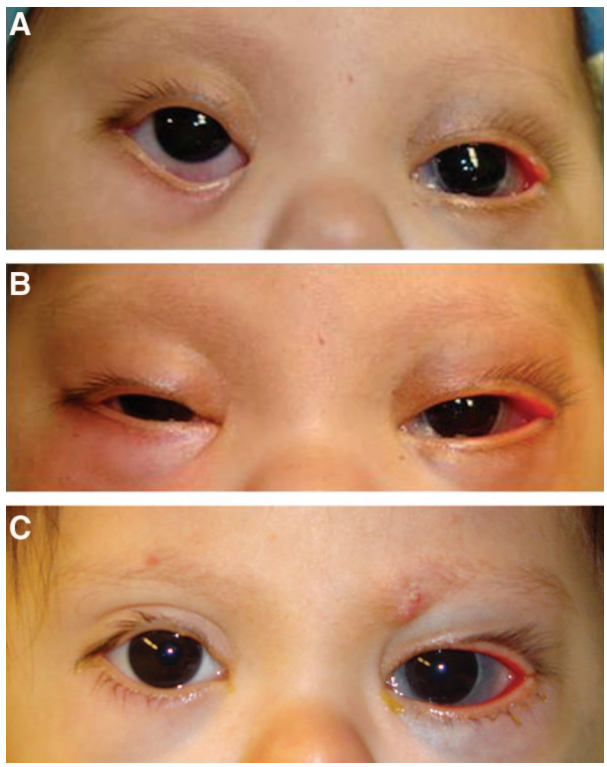

FIG. 5. (Patient 3 in Table) **A,** External photographs (eyelids open) of a 2-month-old boy with Down syndrome and lower eyelid retraction right greater than left, who underwent hyaluronic acid gel injection of the lower eyelids. **B,** There is good eyelid contour and minimal trauma to eyelids immediate postinjection. **C,** Note adequate right lower eyelid support at 18-month follow-up.

general anesthesia with invasive surgery. Moreover, surgical options are not ideal in such patients, given the localized anatomy with shortage and tightness of skin and eyelid. In addition, postoperative management of such patients using traditional procedures is difficult, especially if there is developmental delay. Using this minimally invasive approach, the surgeon has the ability to fine-tune the placement of the gel at specific sites to attain an optimal result. In addition, the treatment can be repeated, if necessary, to adjust the eyelid position (Fig. 3). Moreover, hyaluronidase can enzymatically reverse any unwanted hyaluronic acid gel. Finally, the hyaluronic acid gel may cause permanent correction of congenital eyelid malpositions by allowing tissue expansion to take effect over time. Permanent tissue expansion could maintain the treatment effect after the hyaluronic acid gel is resorbed.

There were only minor side effects in our study. Patients may experience transient edema, erythema, tenderness, and pain that may last for a few days. Ecchymosis may persist for up to 2 weeks. Of the 10 eyelids injected, only 1 had increased astigmatism after injection. As alluded to earlier, hyaluronidase can be used in such cases to reverse the effect of hyaluronic acid gel if necessary. The risk of severe complications is remote,[11,12] and there were no vision-threatening complications from periorbital injections in this study. It should be noted, however, that intravascular injection of any type of filler agent can cause tissue necrosis, particularly in the glabellar region. The risk of embolization in the orbital circulation is a remote but potentially severe complication as with any injection in the orbital area.[13–15] To minimize the risk, we recommend injecting with a small-gauge needle, using minimal force, and avoiding any visible blood vessels.

The limitations of our study should be considered. The number of patients is small with different types of congenital eyelid malpositions and variability in the baseline severity of lagophthalmos and keratopathy. Furthermore, the follow-up period was limited and differed among the patients. Long-term follow-up will better clarify the required frequency of injections and the degree of hyaluronic acid gel retention and eyelid position over time, especially given the tissue/skin expansion property of this treatment modality.

Hyaluronic acid gel shows promise as a novel, quick, safe, effective, predictable, nonsurgical means to manage a variety of congenital eyelid malpositions, including eyelid retraction, ectropion, euryblepharon, epiblepharon, and abnormalities, associated with a shallow orbit. Congenital eyelid malpositions are rare but often require early intervention. To our knowledge, this is the first study that describes the use of hyaluronic acid gel in such young patients. The results are comparable with its use in adult cases.[9] The temporary effect of filler offers the capability to provisionally adjust the eyelid position over time, thus eliminating the potential morbidities of surgical intervention early in life in these patients who are commonly premature and in poor general health, and injections can be repeated to maintain the effect. Long-term prospective studies are needed to ascertain the clinical efficacy over time and the potential for permanent remodeling due to the stretching of soft tissues. Even if surgery eventually becomes necessary, the patient would be older and potentially in better health to undergo invasive surgery with a better outcome, given the growth of surrounding tissues.

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