

Use of Hyaluronic Acid Gel for Upper Eyelid Filling and Contouring

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Purpose: To describe the use of hyaluronic acid gel for upper eyelid filling, contouring, and rejuvenation.

Methods: In this consecutive, retrospective, interventional case series, standard serial puncture injections with preperiosteal placement of filler were administered at the superior orbital rim. Outcome measures included classification of upper eyelid volume deficiency as I) medial A-shaped hollow, II) generalized hollow, III) postblepharoplasty volume loss, and IV) upper eyelid hooding with subbrow volume deflation; volume of filler used; masked, independent assessment of pretreatment and post-treatment photographs; patient satisfaction; and complications.

Results: Twenty-seven patients were included with a mean follow-up of 13 months. More than 85% were white women with a mean age of 51 years (range, 24–65 years). Five patients were classified as type I, 8 as type II, 11 as type III, and 3 as type IV. The mean volume of filler used was 0.4 ml/eyelid (range, 0.1–1 ml). Photographic assessment showed improved static upper eyelid contour in 23 patients (85%), little change in 3 patients (11%), and deterioration in 1 patient (4%). Twenty-six patients (96%) were satisfied with the treatment, although 5 (19%) requested additional filler and 1 patient underwent dissolution within 3 months. Two of the 3 type IV patients still required blepharoplasty/ptosis surgery. All patients developed mild bruising and swelling but no discoloration or lumpiness.

Conclusions: Hyaluronic acid filler is an effective means of rejuvenating the upper eyelid and is particularly successful in patients with medial/generalized upper eyelid hollowing, or significant postblepharoplasty upper eyelid show. A blepharoplasty/brow lift/ptosis procedure is still frequently required for hooding due to subbrow deflation (type IV).

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Soft-tissue and bony volume loss is now thought to be a significant contributor to facial aging.^{1–6} In the brow/upper eyelid complex, such volume loss deflates the skin and, together with gravitational effects and loss of skin elasticity, leads to a range of effects including brow ptosis, dermatocha-

lasis, unmasking of the medial fat pad, increased upper eyelid show, and hollowing of the upper eyelid sulcus. Traditional brow and blepharoplasty surgery has focused on the tightening or excision of excess skin and muscle in an attempt to reduce the soft-tissue “envelope,” and on the removal of any prominent eyelid fat. However, the long-term follow-up of patients undergoing such procedures has shown that, over time, such surgery can exacerbate the natural volume loss that occurs with aging and can lead to a skeletonized socket. Correction of this postsurgical appearance remains a challenge to many oculofacial surgeons today.

Consequently, there has been a shift toward primary volume replacement when rejuvenating the periorbital region. This concept is well established in the lower eyelid, where treatment options have included malar implants,⁷ fat repositioning,⁸ autogenous fat grafting,^{9–11} and the use of synthetic fillers.^{12–16} The latter have typically involved nonanimal, stabilized, hyaluronic acid gels and are associated with high success rates, high patient satisfaction, and few complications.^{12–16} In the upper eyelid, autologous fat transfer has been used to augment volume^{9–11,17–19} and hyaluronic acid gel has been used in monkeys to treat superior sulcus deformities.¹⁶ However, as yet, no documented studies exist describing the use of hyaluronic acid fillers for the correction of upper eyelid hollows, deflation, or skin-fold asymmetries.

Over the last 12 months, we have offered upper eyelid contouring using hyaluronic acid gel for both rejuvenation and for correction of upper eyelid asymmetries due to congenital or acquired unilateral volume loss. This article reports our experience with such fillers, the technique used for their administration, and treatment outcomes.

METHODS

The study was conducted as a consecutive, retrospective, interventional case series, based at 2 centers. Data were collected in accordance with the guidelines of our respective institutional review boards. All patients who had received upper eyelid hyaluronic acid filler at these locations over a 12-month period from August 2007 to August 2008 were identified from the surgical logs of the senior treating surgeons (R.M. and R.A.G.), and the case notes were reviewed. Data were collected on patient demographics, the type of upper eyelid volume deficiency, the volume of filler used, any ensuing complications, and any request for top-up or dissolution of the filler within 3 months of the original treatment; independent, masked assessment of pre- and posttreatment photographs; and overall patient satisfaction. In all cases, the hyaluronic acid gel used was Restylane (Medicis Aesthetics, Inc., Scottsdale, AZ, U.S.A., and Q-Med UK Ltd., London, United Kingdom). This was administered to the upper eyelid/brow region by a standard technique, as follows.

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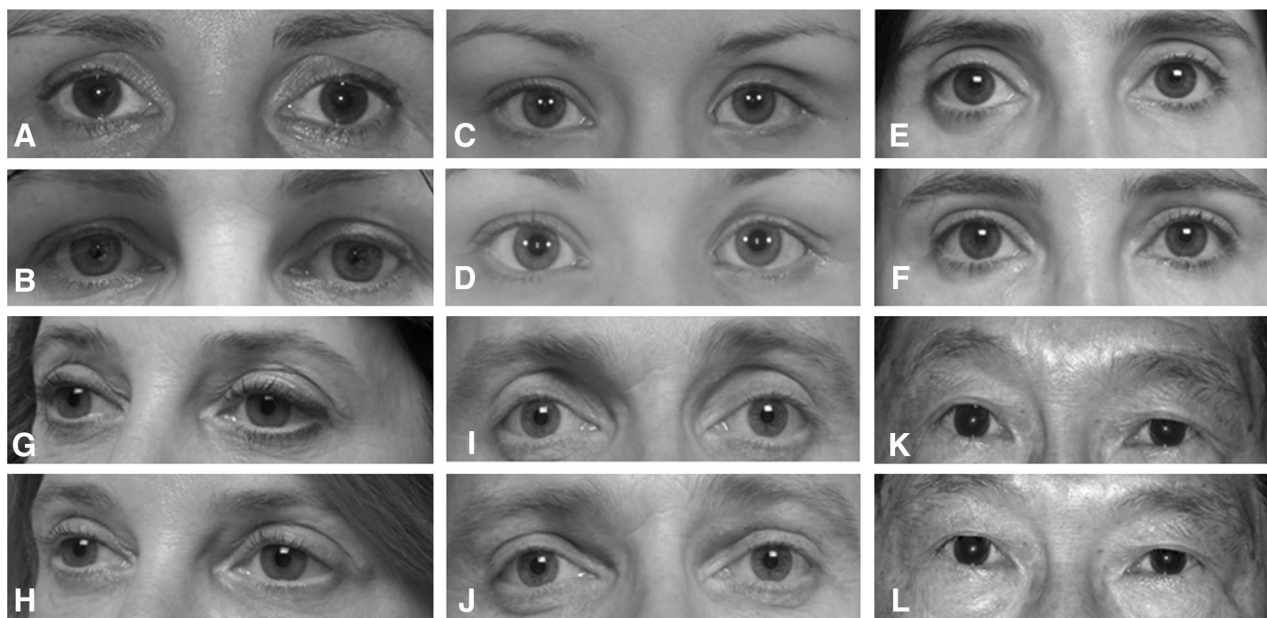


FIG. 1. Examples of patients with each of the 4 types of upper eyelid hollowing, before and after treatment with hyaluronic acid gel. **A**, Patient with type I hollowing pretreatment (medial A-shaped hollow); **B**, same patient 12 months after bilateral treatment. **C**, Patient with type II hollowing pretreatment (generalized hollow); **D**, same patient immediately following treatment to the left upper eyelid only. **E**, Patient with type III hollowing pretreatment (postblepharoplasty generalized volume loss with no skin excess); **F**, same patient 4 months after bilateral treatment. **G**, Another patient with type III hollowing pretreatment; **H**, same patient 4 months after bilateral treatment. **K**, Patient with type IV hollowing pretreatment (upper eyelid hooding with subbrow deflation); **L**, same patient immediately following bilateral treatment.

Injection Technique. The patient's upper eyelid skin was numbed with ice and wiped with an alcohol swab. With the patient supine and the eyes in downgaze, a needle puncture was created close to the junction of the lateral wall and roof. The needle tip was advanced in the suborbicularis plane until it reached the inferior border of the superior orbital rim and 0.1 ml hyaluronic acid gel was injected preperiosteally. The needle was withdrawn, and the raised bleb was molded over the anterior aspect of the orbital rim in a medial direction to achieve a smooth contour. The patient was asked to look straight ahead and the upper eyelid contour inspected. This process was repeated 2 or 3 more times, using a serial puncture technique, with each injection progressively more medial. The supraorbital notch was avoided to minimize trauma to the supraorbital neurovascular complex. After the injections, the patient was asked to raise the eyebrows, and the filler was molded onto the anterior surface of the orbital rim. With the brows relaxed, the upper eyelid contour was reassessed to evaluate any residual lumpiness or irregularity. Injection end points included symmetrical fullness of the preseptal skinfold and softening of any hollows.

Patients were advised to avoid exercise and alcohol for 24 hours and direct pressure on the upper eyelid region area for 72 hours. Regular ice packs and analgesia were recommended. No routine postoperative visit was scheduled, but all patients underwent a telephone review the following day. Prompt follow-up was arranged if concerns were apparent.

Data Collection and Outcome Measures. The type of upper eyelid volume deficiency was classified in one of the following 4 groups: I) medial A-shaped hollow (often misinterpreted as lateral brow ptosis); II) generalized hollow; III) postblepharoplasty generalized volume loss with no skin excess; and IV) upper eyelid hooding with subbrow deflation. Detailed examples of all of these types of upper eyelid volume loss are shown in Figure 1. All patients had pretreatment and posttreatment clinical photographs on file, taken with standard positioning and lighting at each visit. The appearance of the upper eyelid/

brow complex on these photographs was reviewed independently by a clinician who was masked to the treatment used and to the patient satisfaction score. If more than one treatment was given within the first 3 months, the final photograph was used as the posttreatment comparison. The appearance of the upper eyelid/brow complex posttreatment was graded on a subjective scale of -1 (worse), 0 (no change), and 1 (improved). Patient satisfaction with the procedure was based on patient feedback from the final consultation.

RESULTS

In total, 27 patients received upper eyelid hyaluronic acid gel, with a mean follow-up of 13 months. Of these, 24 were women and 23 (85%) were white. Their mean age was 51 years (range, 24–65 years). One patient had Parry-Romberg syndrome, but in the others, the etiology was age-related or postblepharoplasty. In all cases, this was the patient's first treatment with upper eyelid/brow filler. Five patients were classified as type I (medial A-shaped hollow), 8 as type II (generalized hollow), 11 as type III (postblepharoplasty generalized volume loss with no skin excess), and 3 as type IV (upper eyelid hooding with subbrow deflation).

The mean volume of hyaluronic acid gel injected per eye was 0.4 ml (range, 0.1–1 ml). All patients developed some bruising and swelling within 24 hours of administration of the filler, which persisted for no more than 5 days and was readily managed with the use of concealer or sunglasses. No patients developed blue discoloration or irregular lumpiness at the site of injection of the filler, unlike in similar series documenting tear-trough contouring.^{14,15} However, the filler was visible in 2 patients on marked brow elevation.

Five patients (19%) requested additional treatment with hyaluronic acid gel to the upper eyelid, and one patient underwent dissolution of the gel with hyaluronidase within the first 3 months of treatment. The latter was because of concerns that her appearance had altered too much, despite having an objectively satisfactory result on

clinical and masked photographic assessment. However, she remained satisfied with the overall procedure.

Two of the 3 type IV patients had minimal change and went on to have ptosis/blepharoplasty surgery. Both eventually had a good outcome although one required a revision blepharoplasty procedure and developed marked, acute bilateral upper eyelid swelling 1 month postoperatively that was centered around the area treated with hyaluronic acid filler 6 months earlier. Both upper eyelids were injected with hyaluronidase, after which the swelling rapidly settled. No additional risk factors were identified that could have contributed to this complication except for the patient's regular use of swimming goggles over the treated area.

Independent, masked assessment of photographs revealed that 23 patients (85%) had improvement, 3 (11%) had little change, and 1 (4%) had deterioration in static upper eyelid fold contour. Overall, 26 of 27 patients (96%) were satisfied with the treatment. The only patient to express dissatisfaction with the upper eyelid nonanimal, stabilized, hyaluronic acid contouring was the other type IV patient who required a ptosis/blepharoplasty procedure. She did not request hyaluronidase and was satisfied with her surgical treatment.

DISCUSSION

The oculofacial literature has shown recent concerns about the traditional excisional or "lifting" approach to periocular rejuvenation.^{8,9,11,18-21} Although such surgery in the upper eyelid area certainly improves the brow ptosis and dermatochalasis that develops with aging, it does not address the fundamental loss of soft-tissue volume that contributes to these aging changes. Consequently, such techniques often change a patient's appearance and can paradoxically serve to age a patient further. For example, brow lifts can result in inappropriate elevation of the brow, which lengthens the orbital distance (the distance from the brow to the nasojugal fold) and emphasizes the superior orbital rim. This contrasts with the youthful eye, which actually has a relatively short orbital distance with low brows and a full supraorbital rim. A similar effect is seen in traditional excisional upper eyelid blepharoplasty where the orbit is often skeletonized.²⁰ Such effects age the eye by making it appear smaller, with the focus falling on the superior eyelid sulcus.^{18,22} However, the simultaneous lack of hooding or dermatochalasis following surgery produces a conflicting picture and can yield an unnatural appearance.

Hyaluronic acid gel fillers offer a versatile and safe method of replacing soft tissue lost from the upper eyelid/brow complex. Unlike autologous fat transfers they have no associated donor site morbidity, no risk of graft hypertrophy, the ability to be performed in the office, the ability to be molded, the potential for complete reversibility, and minimal risk of lumpiness, bruising, or infection.^{12-15,23,24} Hyaluronic acid gels have already been used successfully in both facial and lower eyelid rejuvenation¹²⁻¹⁶ and have proved popular with patients because of these properties, all of which have been manifested in our case series. If anything, the results we obtained with upper eyelid contouring actually exceeded those documented for the tear trough region, in terms of objective photographic improvement scores (85%), patient satisfaction scores (96%), and by the lack of any reported lumpiness or blue discoloration.^{14,15} These results may relate to the increased thickness of the subbrow skin and the looser nature of the upper eyelid preseptal skin as compared with that in the tear-trough region. The use of hyaluronic acid gels with reduced viscosity and particle size, as compared with Restylane, may serve to reduce the need for vigorous molding and may minimize bruising and swelling further. This is particularly feasible in the

upper eyelid region because of the small volumes of filler required.

No episodes of skin necrosis, cellulitis, or visual loss occurred in our series, despite isolated reports of such problems following various filler treatments to the face.^{15,25-29} In particular, visual loss remains a specific concern in periocular filler treatment because the palpebral and anterior orbital vasculature is derived from the same source that supplies the globe (the ophthalmic artery). This permits retrograde embolization to occur to the central retinal and posterior ciliary arteries from an accidental high-pressure injection in one of the terminal periocular arteries. In the upper eyelid, specific care must be taken medially where the supraorbital and supratrochlear vessels lie. In addition, the risks of globe penetration and orbital hemorrhage must be considered when administering any periocular injection. Consequently, all of our patients had their visual acuity measured prior to treatment and were informed of the remote chance of visual loss. Slow injection of filler and deep preperiosteal placement helps to reduce these risks.

These results suggest that the greatest challenge in upper eyelid filler treatments is not administration of the filler but careful selection of the appropriate patient. We found our simple classification of the pattern of upper eyelid volume loss to be helpful in identifying patients that were best suited to hyaluronic acid gel contouring and for planning their treatment. The first 3 categories involve situations of upper eyelid hollowing where there is a reasonable brow position and minimal dermatochalasis. This can be due to age-related or pathologic factors (types I and II) or following blepharoplasty surgery (type III). Such patients represented most of those treated in our series (89%), and all were satisfied with their treatment outcomes. In particular, type II patients (generalized upper eyelid hollow) and type III patients (postblepharoplasty without skin excess) did very well, with objective photographic improvement in all cases. Although all of the type I patients in our series were satisfied with the treatment, 2 (40%) had no objective improvement on photographic assessment, highlighting the increased technical difficulty of medial filling and molding due to the presence of the supraorbital neurovascular bundle in that area. In addition, one type I patient did not like the alteration in her upper eyelid contour despite objectively successful treatment. This latter case emphasizes the need for careful evaluation of old photographs, particularly in patients who have not had previous surgery, so as to ascertain their original degree of youthful upper eyelid fullness. Care must be taken not to deviate from the patient's natural youthful contour unless it is specifically requested.

In contrast to the first 3 groups, type IV patients exhibited significant subbrow deflation with brow ptosis, dermatochalasis, and even blepharoptosis. These were the least common type of patients to be treated (11% of the total) but proved to be the most difficult. Although subbrow deflation is theoretically amenable to volume augmentation, we found that little change was noted in the upper eyelid/brow complex unless the brow displacement and dermatochalasis was mild. Consequently, 2 of the 3 patients (67%) in this group with more advanced subbrow deflation and hooding showed no objective photographic change with hyaluronic acid gel contouring and went on to have a blepharoplasty/ptosis procedure. Levator advancement can help to improve the upper eyelid hollowing in these cases by enhancing the anterior orbital volume and camouflaging the medial fat pad. One of these patients was the only patient to describe dissatisfaction with the upper eyelid filler treatment itself (4% of the total number of patients treated).

When treating patients who have one of the first 3 types of upper eyelid hollowing, the concept of "balanced upper

eyelid proportions” can be very helpful. This is formalized by the upper eyelid ratio, which compares the visible distance, in the primary position, between the eyelid margin and the upper eyelid skinfold (termed “pretarsal show”), with that between the skinfold and relaxed brow (termed “preseptal show”). The ratio is best used only for patients with reasonable brow position and eyelid height (i.e., hollowing types I to III) because significant brow displacement or blepharoptosis can confuse the measurements. In general, the upper eyelid ratio increases from medial to lateral within the upper eyelid (i.e., approaches 1:0). It also increases with age, due to a rising skinfold caused by volume loss in the eyelid and subbrow region. Furthermore, this increase may occur asymmetrically, as in type I medial hollowing. Balanced proportions between both medial and lateral ratios, and values in keeping with the patient’s youthful appearance should be considered the goal of any filler treatment. This is best obtained by careful comparison between the patient’s upper eyelid ratios determined from old

photographs and their current measurements recorded in the office. The concept of the upper eyelid ratio and its alteration with age and hyaluronic acid filler treatment is illustrated in Figure 2.

In conclusion, current surgical approaches to upper eyelid and brow rejuvenation do not address the soft-tissue volume loss caused by aging and as such can lead to unnatural results. Such deflation can be effectively corrected with hyaluronic acid gel injections, particularly in patients with stable brows and without excessive dermatochalasis. However, care should be taken in patients with marked subbrow deflation or hooding where blepharoplasty/ptosis repair is frequently required. This can still be complemented with upper eyelid filling to create a more natural look by camouflaging the superior orbital rim, filling the superior sulcus, and reducing the upper eyelid ratio. The treatment is safe, well tolerated, titratable, reversible, and has a high patient satisfaction.

REFERENCES

1. Donath AS, Glasgold RA, Glasgold MJ. Volume loss versus gravity: new concepts in facial aging. *Curr Opin Otolaryngol Head Neck Surg* 2007;15:238–43.
2. Coleman SR, Grover R. The anatomy of the aging face: volume loss and changes on 3-dimensional topography. *Aesthetic Surg J* 2006;26:S4–9.
3. Zimblor MS, Kokoska MS, Thomas JR. Anatomy and pathophysiology of facial aging. *Facial Plast Surg Clin North Am* 2001;9:179–87, vii.
4. Donofrio LM. Fat distribution: a morphologic study of the aging face. *Dermatol Surg* 2000;26:1107–12.
5. Pessa JE, Zadoo V, Mutimer KL, et al. Relative maxillary retrusion as a natural consequence of aging: combining skeletal and soft-tissue changes into an integrated model of midfacial aging. *Plast Reconstr Surg* 1998;102:205–12.
6. Pessa JE, Desvigne LD, Lambros VS, et al. Changes in ocular globe-to-orbital rim position with age: implications for aesthetic blepharoplasty of the lower eyelids. *Aesthetic Plast Surg* 1999;23:337–42.
7. Flowers RS. Tear trough implants for correction of tear trough deformity. *Clin Plast Surg* 1993;20:403–15.
8. Goldberg RA. Transconjunctival orbital fat repositioning: transposition of orbital fat pedicles into a subperiosteal pocket. *Plast Reconstr Surg* 2000;105:743–8; discussion 749–51.
9. Coleman SR. Facial recontouring with liposuction. *Clin Plast Surg* 1997;24:347–67.
10. Seiff SR. The fat pearl graft in ophthalmic plastic surgery: everyone wants to be a donor! *Orbit* 2002;21:105–9.
11. Ciuci PM, Obagi S. Rejuvenation of the periorbital complex with autologous fat transfer: current therapy. *J Oral Maxillofac Surg* 2008;66:1686–93.
12. Airan LE, Born TM. Nonsurgical lower eyelid lift. *Plast Reconstr Surg* 2005;116:1785–92.
13. Kane MA. Treatment of tear trough deformity and lower lid bowing with injectable hyaluronic acid. *Aesthetic Plast Surg* 2005;29:363–7.
14. Goldberg RA, Fiaschetti D. Filling the orbital hollows with hyaluronic acid gel: initial experience with 244 injections. *Ophthal Plast Reconstr Surg* 2006;22:335–41; discussion 341–3.
15. Steinsapir KD, Steinsapir SM. Deep-fill hyaluronic acid for the temporary treatment of the naso-jugal groove: a report of 303 consecutive treatments. *Ophthal Plast Reconstr Surg* 2006;22:344–8.
16. Bosniak S, Cantisano-Zilkha M. Restylane and Perlane: a six year clinical experience. *Oper Tech Oculoplast Orbital Reconstr Surg* 2001;4:89–93.
17. Shorr N, Christenbury JD, Goldberg RA. Free autogenous “pearl fat” grafts to the eyelids. *Ophthal Plast Reconstr Surg* 1988;4:37–40.
18. Berman M. Rejuvenation of the upper eyelid complex with autologous fat transplantation. *Dermatol Surg* 2000;26:1113–6.

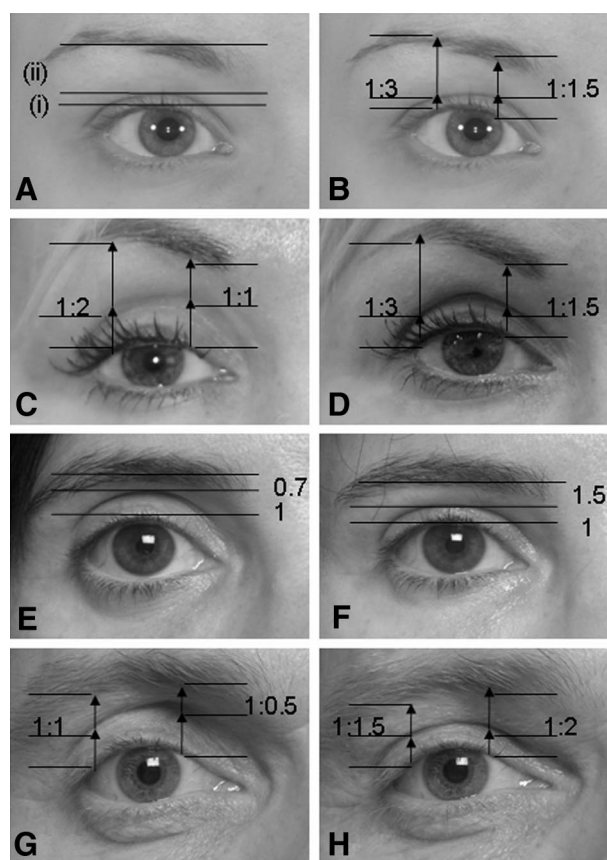


FIG. 2. Photographs illustrating the concept of the upper eyelid ratio and its alteration with age and hyaluronic acid filler treatment. **A**, A youthful upper eyelid (25 years) showing measurement of the upper eyelid ratio where (i) = pretarsal show and (ii) = preseptal show. **B**, The same eyelid showing a lateral ratio of 1:3 and a medial ratio of 1:1.5. **C**, An aged upper eyelid (45 years) with a lateral ratio of 1:2 and a medial ratio of 1:1. **D**, The same upper eyelid immediately posttreatment showing a lateral ratio of 1:3 and a medial ratio of 1:1.5. **E**, Another aged upper eyelid (38 years) with an overall upper eyelid ratio of 1:0.7. **F**, The same eyelid 4 months posttreatment showing an overall ratio of 1:1.5. **G**, A postblepharoplasty upper eyelid with a lateral ratio of 1:1 and a medial ratio of 1:0.5. **H**, The same eyelid 4 months posttreatment showing a lateral ratio of 1:1.5 and a medial ratio of 1:2.

19. Frileck SP. The lumbrical fat graft: a replacement for lost upper eyelid fat. *Plast Reconstr Surg* 2002;109:1696–705; discussion 1706.
20. Kranendonk S, Obagi S. Autologous fat transfer for periorbital rejuvenation: indications, technique, and complications. *Dermatol Surg* 2007;33:572–8.
21. Goldberg RA. Lower blepharoplasty is not about removing skin and fat. *Arch Facial Plast Surg* 2000;2:22.
22. Freund RM, Nolan WB III. Correlation between brow lift outcomes and aesthetic ideals for eyebrow height and shape in females. *Plast Reconstr Surg* 1996;97:1343–8.
23. DeLorenzi C, Weinberg M, Solish N, Swift A. Multicenter study of the efficacy and safety of subcutaneous non-animal-stabilised hyaluronic acid in aesthetic facial contouring: interim report. *Dermatol Surg* 2006;32:205–11.
24. Carruthers A, Carruthers J. Non-animal-based hyaluronic acid fillers: scientific and technical considerations. *Plast Reconstr Surg* 2007;120(6 suppl):33S–40S.
25. Schanz S, Schippert W, Ulmer A, et al. Arterial embolization caused by injection of hyaluronic acid (Restylane). *Br J Dermatol* 2002;146:928–9.
26. Apte RS, Solomon SD, Gehlbach P. Acute choroidal infarction following subcutaneous injection of micronized dermal matrix in the forehead region. *Retina* 2003;23:552–4.
27. Stegman SJ, Chu S, Armstrong RC. Adverse reactions to bovine collagen implant: clinical and histological features. *J Dermatol Surg Oncol* 1988;14:39–48.
28. Danesh-Meyer HV, Savino PJ, Sergott RC. Case reports and small case series: ocular and cerebral ischemia following facial injection of autologous fat. *Arch Ophthalmol* 2001;119:777–8.
29. Teimourian B. Blindness following fat injections. *Plast Reconstr Surg* 1988;82:361.