Upper Eyelid Ptosis Correction with Levator Advancement Using the Levator Musculoaponeurotic Junction Formula in White Patients

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Background: Upper eyelid ptosis correction is a challenging procedure. The authors report a novel approach to this procedure that is more accurate and predictable compared with conventional approaches.
Methods: A preoperative system of assessment has been formulated to more accurately estimate the amount of levator advancement required. The levator advancement was referenced from a constant landmark: the musculoaponeurotic junction of the levator palpebrae superioris. The factors considered include the amount of upper lid elevation required, the degree of compensatory brow elevation present, and eye dominance. The preoperative assessment and surgical technique are presented in a series of detailed operative videos. The levator advancement is performed as planned preoperatively with final adjustment made intraoperatively to achieve correct lid height and symmetry.
Results: Seventy-seven patients (154 eyelids) were analyzed prospectively in this study. The authors found this approach to be reliable and accurate in predicting the required amount of levator advancement. Intraoperatively, the formula correctly predicted the exact required fixation location in 63% of eyelids, and to within ±1 mm in 86% of cases. This may be used for patients with ptosis of varying severity, ranging from mild to severe eyelid ptosis. The revision rate was 4%.
Conclusion: This approach is accurate in determining the fixation location needed, enabling levator advancement for ptosis correction to be performed with more precision and predictability. *(Plast. Reconstr. Surg.* 153: 1403, 2024.)
CLINICAL QUESTION/LEVEL OF EVIDENCE: Therapeutic, IV.

Upper eyelid ptosis correction is a challenging procedure.[1–3] The outcomes of conventional approaches are variable, with reported revision rates ranging from 8.7% to 18%.[4–9] Levator advancement is the most commonly used technique for upper eyelid ptosis correction (Fig. 1).[10] Conventionally, the levator is shortened by a prescribed amount from its lower edges for every millimeter of upper eyelid elevation that is required (1:3 or 1:4).[11–17] However, this formula is notoriously unreliable. Patients with eyelid ptosis often have associated frontalis activation with eye opening. This is a compensatory response to blepharoptosis and has the effect of elevating the upper lid margin.[17–21]

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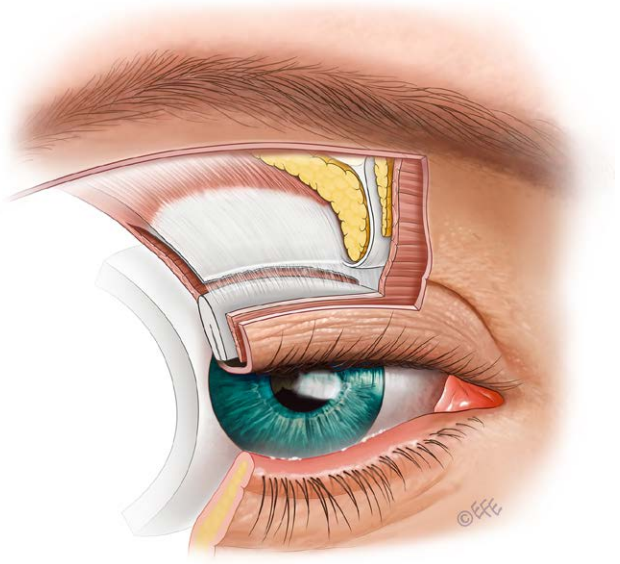

Fig. 1. The mechanism of acquired upper eyelid ptosis is partial or complete detachment of the levator aponeurosis off the superoanterior surface of the tarsus. This results in narrowing of the eyelid aperture (eyelid ptosis) and compensatory activation of the frontalis to compensate for the inadequate eye opening. The levator advancement procedure reattaches the levator onto the tarsus. Finding the correct location on the levator aponeurosis (or higher up in the levator muscle) to advance or attach onto the tarsus to restore the lid margins to an adequate height is key to this procedure. Illustration published with permission from Levent Efe. Copyright © 2023 Levent Efe.

For this reason, the degree of frontalis activity with eye opening should be taken into consideration in the preoperative assessment of patients with eyelid ptosis.[22] A further consideration relates to the fact that afferent nerve signaling for eye opening and frontalis compensation is usually not symmetric from both eyes but preferential from one dominant eye.[22–25] This neuroactivation for eye opening will also be affected by the ptosis correction and therefore should be considered.[26,27] In this article, we present a novel formula we developed to determine preoperatively the level of fixation on the levator relative to a constant landmark—the musculoaponeurotic junction of the levator.[18,19] Our surgical technique and outcomes with the use of this technique are presented.

PREOPERATIVE DETERMINATION OF FIXATION LOCATIONS

Our preoperative estimation of the location of fixation on the levator of the upper eyelid relative to the musculoaponeurotic junction is based on three measures (Table 1)[18,19,28]:

(A) The amount of elevation of the upper eyelid that is needed, calculated by deducting the preoperative margin to reflex distance (MRD) from the ideal, targeted MRD of +4.5 mm (Fig. 2).[29,30]

(B) The degree of compensatory frontalis activity, as manifest by the amount of brow elevation observed with eye opening, which is graded categorically and accordingly assigned ascending values of tightening [**See Video 1 (online)**, which demonstrates how we assign a value to measure B based on our assessment of brow elevation.]

(C) Eye dominance, as determined by the Dolman method[31]; innervation for eye opening is primarily from the dominant eye (Herring reflex of equal innervation); ptosis correction in the dominant eye would result in slight drop of the eyelid margin in the nondominant eye,[13,21,23,24,28,31,32] and to account for this, a value of +1 mm of tightening is empirically assigned to the nondominant eye.

Table 1. Formula for Determining the Levator Advancement Needed[a]

Ptosis Correction Needed, mm (Measure A)	Brow Elevation with Eye Opening (Measure B)	Eye Dominance (Measure C)
0: −6.0	Absent: +0	Dominant eye: +0
0.5: −5.5	Mild minus: +0.5	Codominant eye: +0
1: −5.0	Mild: +1	Nondominant eye: +1
1.5: −4.5	Moderate minus: +1.5	
2: −4.0	Moderate: +2	
2.5: −3.5	Severe minus: +2.5	
3: −3.0	Severe: +3	
3.5: −2.5		
4: −2.0		
4.5: −1.5		
5: −1.0		

[a]These values are referred from the musculoaponeurotic junction (MAJ) of the levator of the upper eyelid, with a value of 0 mm denoting the location of the MAJ and negative and positive values denoting distance below and above this landmark, respectively. Measure A is the amount of upper eyelid elevation needed, measure B is the degree of brow elevation present with eye opening, and measure C is eye dominance. Summation of these 3 measures gives a value that is the expected levator advancement needed for that eyelid. Estimated distance (in millimeters) for levator advancement from the musculoaponeurotic junction to anterior tarsus = measures A + B + C.

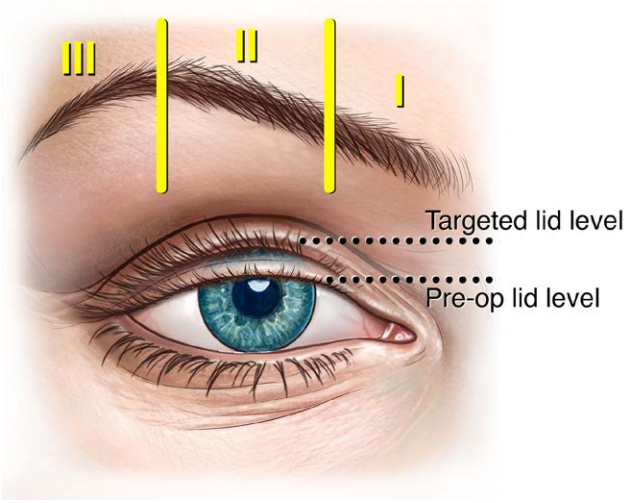

Fig. 2. Ptosis correction needed (measure A in Table 1) is the amount of elevation of the upper eyelid required. This is calculated by deducting the preoperative margin to reflex distance (*MRD* 1) from the ideal (targeted) MRD 1 of +4.5 mm (+4.5 – preoperative MRD). The corresponding distances from the musculoaponeurotic junction required for that amount of eyelid elevation may then be determined from the corresponding values, as shown in Table 1 (measure A). The second measure (measure B) is the amount of brow elevation with eye opening. It may be inferred that the more severe the brow elevation, the more the preoperative eyelid position may be attributed to the contribution of frontalis activation. Therefore, to eliminate the need for frontalis compensation, while maintaining a satisfactory eyelid position, more tightening of the levator would be required. We grade brow elevation as mild when only the medial brow (area I) elevates with eye opening, moderate when the medial and middle thirds (areas I and II) elevate with eye opening, and severe when the entire brow (areas I, II, and III) elevates with eye opening. The more severe the eye opening, the more the levator needs to be tightened to eliminate the need for frontalis compensation. The corresponding values of tightening are as shown in Table 1 (measure B) and the assignment of these values is explained in Video 2. Illustration published with permission from Levent Efe. Copyright © 2023 Levent Efe.

[**See Video 2 (online)**, which demonstrates the application of our formula in estimating the fixation locations relative to the musculoaponeurotic junction preoperatively.]

SURGICAL TECHNIQUE

[**See Video 3 (online)**, which demonstrates our surgical technique.] The procedure is performed under moderate intravenous sedation or local anesthesia. The surgery commences on the dominant eye. Local anesthesia comprising a mixture of 10 cc of 1% lignocaine, 10 cc of 1% ropivacaine, and 0.1 cc of 1:1000 adrenaline is used. Approximately 1 to 1.4 cc of the local anesthetic is used per eyelid. The premarked skin excess is excised. The orbicularis oculi is lifted off the orbital septum and pretarsal tissues. A conservative strip of pretarsal orbicularis oculi is excised (Fig. 3, *above, left*). The orbital septum is carefully incised (Fig. 3, *above, right*). The important landmark to visualize here is the distinct lobular preaponeurotic fat pad. Visualization of this fat pad indicates that the orbital septum has been cut completely. The next landmark to locate is a distinctive white line, which is the lower edge of the levator aponeurosis. Often in patients with upper eyelid ptosis, the lower edge of the levator aponeurosis is partially or completely dehisced off the anterior tarsus and retracted to a more cephalic location. Once the levator aponeurosis has been located, it should be retracted caudally. The orbital septum, located superficial to the levator aponeurosis, may then be completely released from its sling-like attachment to the levator aponeurosis using tenotomy scissors (Fig. 3, *center, left*). This exposes the levator aponeurosis and the musculoaponeurotic junction (Fig. 3, *center, right*). The upper edge of the tarsus is then clearly defined by conservative excision of the pretarsal tissues. The deep surface of the levator aponeurosis may now be lifted carefully off the Muller muscle. This is done conservatively just to the extent necessary for placement of the levator advancement sutures.

The planned level of fixation on the levator relative to the musculoaponeurotic junction, as determined by our preoperative assessment, is marked precisely with a fine caliper dipped in methylene blue (Fig. 3, *below, left*). The levator advancement is then performed using 6/0 Prolene on a round body needle (reference 8610H; Ethicon Inc.). The suture is passed from the location marked, at the vertical location of the midpupil line, through the levator, superficial to and not including the Muller muscle. A firm horizontal bite of the tarsus is then taken, approximately 2 mm below its upper edge. The suture is then passed under the levator aponeurosis again to pierce the levator at a location approximately 2 mm medial to its entrance point (Fig. 3, *below, right*). The suture is then firmly tied.

Dissection is performed on the contralateral, nondominant eye in a similar manner. The levator advancement suture is then placed precisely at the predetermined location and tied. At this juncture, a preliminary assessment is made by having the patient sit up so we can assess eye opening. The palpebral aperture should be both adequate and symmetric, without overcorrection

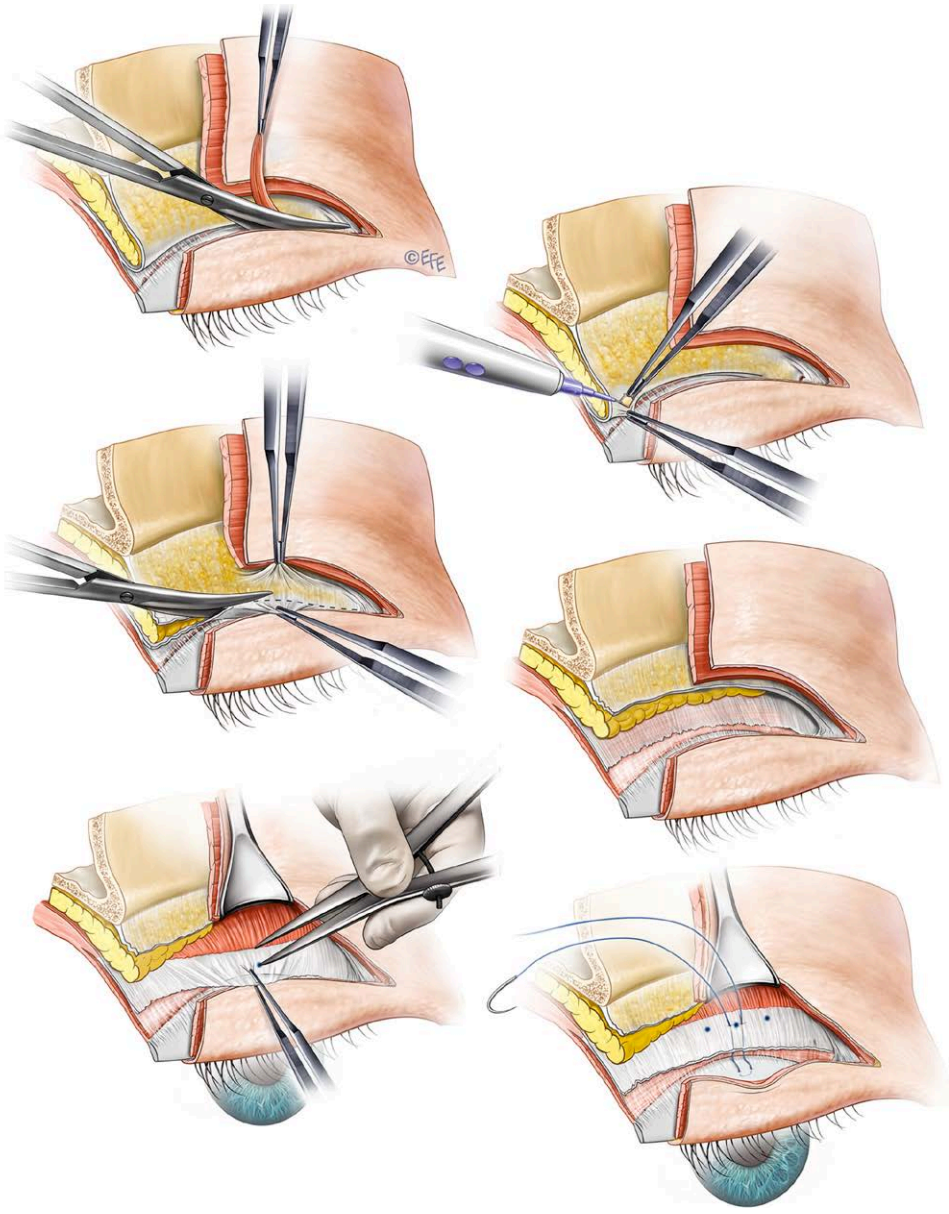

Fig. 3. Key steps in our surgical procedure. (*Above*, *left*) A conservative strip of pretarsal orbicularis is excised. (*Above*, *right*) With the assistant picking up the area of fusion between the levator aponeurosis and orbital septum, and the surgeon providing countertraction by picking up the orbital septum, the orbital septum is opened. (*Center*, *left*) Once the orbital fat pad has been located, the orbital septum located above the fat pad may be opened safely to expose the levator aponeurosis. (*Center*, *right*) The lower edge of the levator aponeurosis (white line) can be seen and partially dehisced off the tarsus. (*Below*, *left*) The musculoaponeurotic junction of the levator is identified and the preoperative estimated fixation location from the musculoaponeurotic junction marked precisely with a caliper. (*Below*, *right*) The levator advancement is performed from the marked location to a point 2 mm below the upper edge of the tarsus. Illustration published with permission from Levent Efe. Copyright © 2023 Levent Efe.

or undercorrection. If these objectives have been achieved, this confirms the correct advancement locations on the levator have been achieved. If not, the locations of the fixation sutures may be adjusted as required. Once adequate and symmetric apertures have been confirmed, the fixation is reinforced by placing two additional fixation sutures on each lid at the vertical levels

of the medial and lateral corneoscleral limbus. The patient is then sat up for a final check of the palpebral apertures. The dermis is then sutured to the lower edge of the levator with Vicryl 7/0 sutures, and the skin is closed with Ethilon 7/0 sutures in a skin-levator-skin manner.

PATIENTS AND METHODS

The inclusion criteria for this study included White patients with mild to severe ptosis and at least fair levator function. Between January of 2017 and March of 2022, 77 patients (53 women and 24 men) who underwent upper eyelid ptosis correction were prospectively included in this study. The mean age of the patients was 43 years (range, 26 to 66). Forty-five (58%) were primary cases, and 32 (42%) were secondary or tertiary cases. The mean operative time was 74 minutes (range, 59 to 120 minutes). Only patients with at least 6-month follow-up were included. Standard preoperative and postoperative photographs were used for comparison. Patients subjectively rated the outcomes of their surgery with a Likert-type scale of eyelid appearance, as follows: 0, worse; 1, unchanged; 2, improved; or 3, markedly improved.[34]

RESULTS

The majority of patients were satisfied with their result, with 74 patients (96%) reporting that their appearance was improved or markedly improved at 6-month follow-up. This procedure can be used predictably for patients with mild (Fig. 4), moderate (Figs. 5 and 6), or severe (Fig. 7) upper eyelid ptosis; in patients with upper eyelid asymmetry (Figs. 8 and 9); and in revision cases with eyelid ptosis after blepharoplasty (Fig. 10). This procedure can be reliably incorporated into cosmetic blepharoplasty for patients with mild ptosis to achieve more predictable functional and aesthetic outcomes (Figs. 11 and 12). Apart from optimization and restoration of the eye aperture evident in before and after photographs, patients also reported symptomatic relief of frontalis strain and improved ease of eye-opening. [**See Video 4 (online)**, which illustrates the long-term dynamic changes and functional benefits of the levator advancement procedure.]

Of the 154 eyelids analyzed in this study, the formula correctly predicted the intraoperative fixation location in 96 eyelids (63%). In 133 eyelids (86%), it was accurate to within ±1 mm. Nineteen of the remaining 21 cases had an intraoperative fixation location within ±2 mm of the preoperative estimated fixation location (ie, 99% of eyelids had a correct fixation location within ±2 mm of the preoperative estimated fixation location). Our revision rate was 4% (three patients). Two patients had slight overcorrection in one eyelid, and the fixation was lowered. This was performed within 1 week of the surgery. One patient had slight overcorrection in one lid 6 months after the surgery, and this was lowered with revision levator surgery. All three revision cases were managed successfully, with good symmetry achieved after the revision.

Fig. 4. (*Left*) A 48-year-old man presented with mild upper eyelid ptosis with the sensation of strain around his eyes to keep his eyelids open. On examination, his MRD 1 was +4 mm and +3.5 mm on the right and left upper eyelid, respectively. He had mild brow elevation on the right and moderate minus brow elevation on the left and was left-eye dominant. A diagnosis of mild bilateral upper eyelid ptosis was made. Estimated fixation was −3.5 (−5.5 +1 +1) on the right and −3.5 (−5.0 +1.5 +0) on the left. Good aperture height and symmetry was achieved intraoperatively at −3.0 and −3.0 mm on the right and left upper eyelid, respectively. (*Right*) Good and stable long-term results are noted at 1 year after surgery. The patient reported good symptomatic relief of periorbital strain and difficulty opening his upper eyelids.

Fig. 5. (*Left*) A 49-year-old man presented with moderate bilateral upper eyelid ptosis. His MRD 1 was +2.0 mm and +2.5 mm on the right and left, respectively. Brow elevation was moderate minus on the right and mild minus on the left. He was right-eye dominant. His preoperative estimation of fixation location was −2 (−3.5 +1.5 +0) and −2 (−3.5 +0.5 +1) on the right and left, respectively. Good ptosis correction and symmetry was achieved intraoperatively at −2 mm and −2 mm on the right and left upper eyelid, respectively. Extended transconjunctival eye bag removal and a composite face lift was performed at the same time. (*Right*) Good long-term correction of the ptosis and effective elimination of the eyelid ptosis symptoms are noted 4 years after surgery.

Fig. 6. (*Left*) A 65-year-old man presented with moderate bilateral upper eyelid ptosis. On examination, the is MRD 1 was +2 mm and +1.5 mm on the right and left upper eyelid, respectively. He had moderate brow elevation with eye opening bilaterally and is right-eye dominant. The fixation points for his levator advancement were estimated at −1.5 mm (−3.5 +2.0 +0) and 0 mm (−3.0 +2.0 +1), respectively; intraoperatively, they were −1.0 mm and 0 mm, respectively. (*Right*) Good long-term correction of the ptosis and effective elimination of the eyelid ptosis symptoms are shown at 18 months after surgery.

Fig. 7. (*Left*) A 55-year-old woman presented with severe eyelid ptosis with obstruction of her upper visual fields. The MRD 1 on the right was +1.0 mm and on the left was +2.0 mm. Her brow elevation on the right was moderate and on the left was moderate minus. She was right-eye dominant. Her estimated fixation on the right was −0.5 (−2.5 +2 +0) and on the left was −1.0 (−3.5 +1.5 +1). Good aperture height and symmetry was achieved intraoperatively at 0 mm and −1.0 mm from the musculoaponeuriotic junction of the levator on the right and left upper eyelid, respectively. (*Right*) Good correction of eyelid ptosis is shown at 3 years after surgery.

Fig. 8. (*Left*) A 44-year-old woman with no medical history presented with upper eyelid asymmetry and heaviness and difficulty opening her eyes. Her MRD 1 was +4.5 mm on the right and +2 mm on the left. Her estimated fixation locations were −4 mm and −1.5 mm, respectively. Adequate correction of her ptosis and symmetry was achieved intraoperatively at precisely the estimated locations at −4 mm and −1.5 mm on the right and left upper eyelid, respectively. (*Right*) Good long-term correction of the ptosis and effective elimination of the eyelid ptosis symptoms are shown at 1 year after surgery. Video 4 shows a comparison of eye opening before and after surgery. The frontalis strain that was evident before surgery when the eyes were opened and closed was eliminated after effective ptosis correction.

Fig. 9. (*Left*) A 41-year-old woman presented for cosmetic upper blepharoplasty. On examination, she had upper eyelid ptosis and asymmetry of the upper eyelids. Her MRD 1 was +2.0 mm and +2.5 mm on the right and left, respectively. With eye opening, brow elevation was mild on the right and moderate minus on the left. She was right-eye dominant. Her estimated fixation locations were −2.5 (−3.5 +1.0 +0) and −2.5 (−4.0 +1.5 +1) on the right and left upper eyelids, respectively. Good aperture correction and symmetry was achieved intraoperatively −2.0 mm and −3.0 mm from the musculoaponeurotic junction on the right and left upper eyelid, respectively. (*Right*) Symmetric palpebral apertures are noted 1 year after surgery. The patient reported satisfaction with the cosmetic outcome of the procedure, including brighter eye appearance and crisper upper eyelid creases.

DISCUSSION

We have previously published our experience with this approach for upper eyelid ptosis correction in Asian patients.[18,19,28] This article documents our experience with this technique in White patients. Eyelid tissues in White individuals are thinner and lighter, and the levator mechanism may be more effective.[35–37] Upper eyelids in White patients are easier to widen, with a greater tendency toward overcorrection compared with Asian eyelids. Because of these inherent differences, recalibration and modifications are required.[35,37] Our formula presented in this article is calibrated for the specific requirements of White eyelids.

The presence of dermatochalasis may interfere with our preoperative analysis. The skin overhang may make the palpebral aperture appear narrower, making the upper eyelid ptosis appear more severe. Also, dermatochalasis itself may induce more frontalis compensation and elevation of the brows. The dermatochalasis would be addressed by skin excision as part of the procedure. However, to eliminate this confounding factor in our preoperative analysis, the excess skin hooding that has descended over the upper eyelid margins may be manually lifted clear of the lid margins for the MRD measurements for measure A, and brow assessment for measure B. This simulates a condition where the skin has been removed and therefore inadequacies of eyelid opening and residual compensatory frontalis responses could be attributed to

Fig. 10. (*Left*) A 60-year-old woman presented with upper eyelid asymmetry. She had a previous upper blepharoplasty 8 years ago. Her MRD 1 was +2.5 mm and +4.0 mm on the right and left, respectively. With eye opening, brow elevation was mild minus bilaterally. She was right-eye dominant. A revision upper blepharoplasty with levator advancement was planned. Her estimated fixation locations were −3.5 (−4.0 +0.5 +0) and −4.0 (−5.5 +0.5 +1) on the right and left upper eyelids, respectively. Good aperture correction and symmetry was achieved intraoperatively at −3.0 and −4.0 on the right and left, respectively. (*Right*) Symmetric palpebral apertures are noted 1 year after surgery.

Fig. 11. (*Left*) A 46-year-old woman presented for cosmetic upper lid blepharoplasty. On examination, she exhibited signs of mild eyelid ptosis with frontalis strain on eye opening, hollowing of the upper lids, and slight drooping of the upper eyelid margin. In cases such as this, with subclinical eyelid ptosis, if a cosmetic skin excision type of blepharoplasty is performed, the asymmetry of the upper eyelids and frontalis strain will likely worsen after surgery (ie, post–upper blepharoplasty syndrome). To prevent this, incorporating the levator advancement into the upper blepharoplasty is critical to delivering better functional and cosmetic outcomes. In the preoperative assessment, her MRD 1 was +3.5 mm and +4.0 mm on the right and left, respectively. Brow elevation with eye opening was mild minus on the right and moderate minus on the left. She was left-eye dominant. Her preoperative estimated fixation location was −3.5 (−5.0 +0.5 +1) and −4.0 (−5.5 +1.5 +0), respectively. Fixation was located at −2.5 mm and −3.0 mm intraoperatively on the right and left, respectively. (*Right*) Good long-term ptosis correction is shown 1 year after surgery. The patient reported that the sensation of difficulty and straining to open her eyes had been eliminated. Video 4 shows a comparison of eye opening before and after surgery. Note that with effective ptosis correction, the hollowing in the upper eyelid was corrected. No upper eyelid fat grafting was performed. Concomitant lower blepharoplasty with mid-cheek lift was performed at the time of the ptosis correction.

the weakness of the levator mechanism of the upper eyelids.

The lower edge of the levator aponeurosis is conventionally used as the key reference point. Three to four millimeters of distal shortening of the levator aponeurosis is recommended for each millimeter of upper eyelid elevation needed (1:3 or 1:4).[11,12,14–16] To be clear, this 3 or 4 mm is needed not only for the 1-mm elevation of the eyelid, but also to account for the anticipated drop in the eyelid margins as the frontalis relaxes and for relaxation of the nondominant eye with correction of the contralateral upper eyelid. One can appreciate why a fixed amount of prescribed shorting to account for the many factors known to affect upper eyelid positioning is only a rough guide and in practice unreliable. A large degree of intraoperative trial-and-error fixation is required with

Fig. 12. (*Left*) A 38-year-old woman presented for cosmetic upper blepharoplasty with complaints of upper eyelid slight skin excess and slight "droopiness" of her right upper eyelids. On questioning, she revealed that she experienced sensations of heaviness and difficulty opening her eyelids, especially toward the end of the day. On examination, her MRD 1 on the right and left were +2.5 and +3.5 mm, respectively. Her brow elevation was mild minus and moderate minus on the right and left, respectively. She is left-eye dominant. The estimated fixation on the right was −2.5 (−4 +0.5 +1) and on the left was −3.5 (−5 +1.5 +0). Upper blepharoplasty with levator advancement was performed. Good symmetry and height of the palpebral aperture was achieved intraoperatively at −1 mm and −2.5 mm on the right and left upper eyelid, respectively. (*Right*) Equal and symmetric palpebral aperture is shown at 9 months after surgery. The slight hollowing and early A-frame deformity of the upper eyelid had resolved with the eyelid surgery, and the patient reported that straining and difficulty opening her eyes had completely resolved.

such approaches. Often the eventual fixation location required for ptosis correction is significantly different from the estimated shortening planned. With our approach, we have attempted to assign a prescribed amount of shortening for each of the three factors known to affect upper eyelid position: the eyelid elevation needed, the severity of the frontalis compensation, and eye dominance. The summation of these factors gives us a specific location from musculoaponeurotic junction. The musculoaponeurotic junction is a more constant landmark (compared with the lower edge of the levator aponeurosis) and is reliable even in revision or secondary cases.[18,19,28] We found this approach to be reliably accurate in predicting fixation points preoperatively, allowing us greater precision in performing this surgery and significantly shortening our operative time (with much less need for intraoperative trial-and-error fixations).

Plastic surgeons must master levator advancement and be comfortable incorporating it into the upper blepharoplasty procedure, because many patients who present for cosmetic upper blepharoplasty may need a levator advancement incorporated into the procedure to achieve the desired outcomes.[1,13,14,33,38,39] Patients may have mild blepharoptosis,[18,19,21,28] and appear not to need levator advancement because of apparent adequacy of their palpebral aperture. However, careful examination will often reveal the presence of a subtle but noticeable degree of frontalis straining that is compensating for minor degrees of levator insufficiency.[32,40] In this group of patients, performing a "cosmetic" skin excision–type upper blepharoplasty alone may exacerbate the levator insufficiency, manifesting with persistent minor asymmetries of the palpebral aperture or worsening of frontalis compensation after surgery. Incorporating precise levator advancement into the procedure would deliver more predictable cosmetic and functional outcomes for these patients.

Accurate assessment of adequacy and symmetry of the correction achieved intraoperatively is the key to success with this procedure. To do this, several aspects of the surgery need to be carefully controlled. First, bleeding and swelling associated with the procedure should be minimized. In addition to meticulous surgical technique, intravenous dexamethasone (8 to 12 mg) and tranexamic acid (1 g) at the start of the procedure is used to minimize swelling and bleeding. Second, hematomas of the levator or the Muller muscle must be avoided. Hematomas are an inherent risk with placement of multiple sutures through the levator, which is a highly vascular area. The two areas at greatest risk for hematomas are the peripheral vascular arcade just above the tarsus where the Muller muscle inserts and the vessels running within the levator muscle. The risk is minimized by avoiding the vessels under direct visualization before suture placement as well as prophylactic cauterizing the vascular arcade above the tarsus before suture placement. When the levator advancement fixation needs to be placed higher into the levator muscle, the hematoma risk is higher, as the vessels within the muscle may not be visible to the

surgeon. Once a hematoma has developed, the turgidity and mechanical obstruction to eye opening will render intraoperative assessment more difficult. Third, when the Muller muscle is stimulated by adrenaline, an additional eyelid elevation of about 1 mm will occur. When fixation determination is done under this condition, what appeared to be adequate correction intraoperatively will result in undercorrection several hours after the surgery when the effects of the adrenaline on the Muller muscle wear off. Therefore, although the use of adrenaline is necessary for its hemostatic effect, its use should be minimized in concentration and in volume of local anesthesia. Lastly, when the procedure is done under intravenous sedation, the patient's state of arousal is critical in the assessment of eye opening. The sedation should be stopped in a timely fashion such that the patient is fully awake when the assessment of adequacy of eye opening is performed. Some patients are sensitive to intravenous sedation and may be drowsy when the assessment is performed. In this state, they may not be fully opening their eyes normally. An adequate aperture achieved under this condition may result in overcorrection when the patient is fully awake.

Despite our best effort, when it is obvious that the aperture is suboptimal in the early postoperative period (up to 3 weeks after surgery), adjustment and refixation is possible and is relatively simple. Under minimal local anesthesia, the incision may be opened gently and the fixation released and re-fixed above or below the fixation location as indicated. Some cases will be equivocal early on, usually because of swelling, and asymmetry will manifest later. In such cases, it is best to wait for the swelling to subside and for the scarring to lessen before attempting revision (at least 4 months after surgery).

Eyelid hollowing, either in primary or in revision cases, is a common feature in many patients presenting for blepharoplasty. Whereas this is usually attributed to fat atrophy with aging, a major contributor to this hollowing is levator dehiscence.[41,42] With disinsertion from the tarsus, the levator retracts superiorly into the orbit, along with the orbital septum, as the two are fused at its lower edges. This results in retraction of the postseptal orbital fat pads further into the orbit along with the levator aponeurosis, resulting in an apparent hollowing of the upper eyelid. This hollowing is one of the clinical signs of eyelid ptosis. Correction of the ptosis lowers the levator, and, with it, the orbital fat pad is similarly lowered. This, together with the expected relaxation of the frontalis and lowering of the brow position, leads to correction of the upper eyelid hollowing after surgery.[22,43,44] This may be seen (in varying degrees) by careful analysis of the patients as presented in Figures 7 through 12 and in Video 4. Fat grafting and synthetic fillers have long been advocated by some authors as the primary modality to treat upper eyelid hollowing, either for primary or secondary corrective cases.[45] This may be used as an effective ancillary procedure, but correcting the primary pathoanatomy of this condition should also be a key consideration.

Compared with the cosmetic skin excision–only blepharoplasty, more swelling and bruising is expected from this procedure. This is attributable to the more extensive dissection and perhaps from the interference with the lymphatics located on the anterior and superior part of the tarsus.[46] Swelling will settle to a reasonable degree for patients to return to work comfortably after 2 to 3 weeks. [**See Figure, Supplemental Digital Content 1**, which shows the early recovery of our patient presented in Figure 8. (*Above*) Preoperatively. (*Center*) One week after surgery, with some bruising and swelling of the upper eyelid. (*Below*) Two weeks after surgery. The bruising and swelling have subsided substantially. Most patients are able to return to work and social activities comfortably 2 to 3 weeks after the surgery, ***http://links.lww.com/PRS/G728***.] In addition to measurable functional and visible aesthetic improvements that upper eyelid ptosis correction can deliver, what is not commonly discussed is the symptomatic relief that the surgery can provide. The surgery relieves the heaviness and difficulty opening the upper eyelids as well as the sensation of constant straining to keep the upper eyelids open. This aspect of this functional procedure results from restoration of intrinsic eye-opening ability transmitted from the levator muscle, thereby negating the need for assistance or contribution of the frontalis to open the upper eyelids.

Limitations of this study include a relatively small number of patients and a need for further validation of the formula. Nevertheless, this approach offers a promising alternative for this challenging procedure.

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DISCLOSURE

The authors declare they have no conflict of interest in the present work. None of the authors has a financial

interest in any of the products, devices, or drugs mentioned in this article.

PATIENT CONSENT

Patients provided written informed consent for the use of their images.

CODING PERSPECTIVE

Coding perspective provided by Jeff Kozlow, MD, MS, is intended to provide coding guidance.

15822	Blepharoplasty, upper eyelid
15823	Blepharoplasty, upper eyelid; with excessive skin weighting down lid
67901	Repair of blepharoptosis; frontalis muscle technique with suture or other material (eg, banked fascia)
67902	Repair of blepharoptosis; frontalis muscle technique with autologous fascial sling (includes obtaining fascia)
67903	Repair of blepharoptosis; (tarso) levator resection or advancement, internal approach
67904	Repair of blepharoptosis; (tarso) levator resection or advancement, external approach
67906	Repair of blepharoptosis; superior rectus technique with fascial sling (includes obtaining fascia)
67908	Repair of blepharoptosis; conjunctivo–tarso–Muller muscle–levator resection (eg, Fasanella-Servat type)

- The repair of blepharoptosis is often considered a reconstructive procedure secondary to lack of appropriate function within the levator muscle apparatus. Blepharoptosis procedures are distinct from upper lid blepharoplasty procedures (codes 15822 and 15823), which address only the skin and/or underlying orbicularis oculi muscle.
- Codes 67901 and 67902 are related procedures in blepharoptosis reconstruction. Both of these procedures use the frontalis muscle to power elevation of the upper lid and replace the function of the levator muscle. Code 67902 includes the use of concurrently harvested autologous fascia compared to code 67901, which uses suture or other material to attach the frontalis muscle to the upper lid.
- Codes 67903 and 67904 describe the direct repair of the levator muscle. This may include tightening of the levator muscle (either with plication sutures or excision/shortening techniques) or reinsertion of the distal muscle to the upper lid tarsus. The selection of code 67903 versus code 67904 depends on the surgical approach; an internal approach through the conjunctiva is reported with code 67903, and an external approach through the skin is reported with code 67904.
  - The technique described in the Patients and Methods section of this article would be reported with code 67904, as it is a direct levator shortening/repair via an external approach.
- Code 67906 is used to report a less common technique of reconstruction in which a fascial graft or sling is used between the superior rectus muscle and the upper lid margin to replace the function of the levator muscle.
- Code 67908 is used to report a combined resection of the conjunctiva, tarsus, Muller muscle, and levator muscle, followed by suture repair to tighten the soft tissues.
- It would be inappropriate to report the blepharoplasty codes (15822 or 15823) in conjunction with codes 69701 through 69708 if the approach for the levator repair is just through the external upper lid skin. However, if the patient also has upper lid dermatochalasis causing part of the functional visual field defect, then additional work to address the excess skin with upper lid blepharoplasty is reported with code 15823. This may be reported on the same eye using a -59 modifier for distinct procedural service versus a -51 modifier for multiple procedure reduction depending on the insurer. Very clear and full documentation of the two separate indications and procedures will likely be expected.
- Bilateral procedures are reported with modifier 50, although some insurers may prefer -LT and -RT modifiers to distinguish the sides, especially when different procedures are performed on each eye.

CODING PRINCIPLE: Blepharoptosis coding is based on the approach and technique reported. The current codes have well-defined descriptors to help guide code selection.

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