Predictable Ptosis Procedures: Do Not Go to the Dark Side

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When I was a fellow with Crowell Beard 36 years ago, he told me “If it weren’t for ptosis surgery, oculoplastic surgeons wouldn’t exist.” At that time I doubted his wisdom. As I have studied the anatomy and physiology of ptosis and other eyelid malpositions and have tried to develop more anatomical oculoplastic procedures, I now realize that if you include all eyelid malpositions controlled by the aponeuroses of extraocular/orbital muscles, he was correct. Some plastic surgeons and facial plastic surgeons can perform eyelid skin removal, skin grafts, tumor removals, forehead lifts, midface lifts, and face lifts and as oculoplastic surgeons. However, none understand ptosis and the anatomy and physiology of the retractors of the eyelids and their aponeuroses as well as an ophthalmologist does. Nor will other groups understand the complications of ptosis surgery, which are related to the eye and their management as well as an ophthalmologist does. Anatomical predictable ptosis procedures separate us from and give us a competitive advantage over other plastic surgeons doing eyelid surgery.

For years, many of us advanced and promoted aponeurotic ptosis surgery that requires understanding and a working knowledge of eyelid and orbital anatomy. I thank Dr. Marvin Quickert, Dr. Orkan Stasior, and Dr. Crowell Beard for motivating me to study the anatomy and physiology of ptosis. Unfortunately, I see some oculoplastic surgeons turning to the dark ages (dark side of the eyelid), giving up our competitive advantage over other specialties. At meetings I hear good oculoplastic surgeons recommending posterior procedures such as the Fasanella or Putterman procedures. I also hear general plastic surgeons advocating these (what I refer to as “eyelid circumcision”) procedures as they require minimal expertise and anatomical knowledge, and have been advocated by reputable oculoplastic surgeons. Authors in our field have written articles stating that the eyeball and tear film are seldom damaged from these “posterior procedures.” Anatomically and physiologically, these procedures cannot avoid damage to the 3-layer tear film and present more risks to the cornea from posterior sutures and manipulations. Removing the tarsus and conjunctiva immediately above tarsus, which has the highest concentration of goblet cells and accessory lacrimal glands, with possible injury to the palpebral lobe of the lacrimal gland, certainly compromises the 3-layer tear film. Many dry-eye and exposure problems manifest years after eyelid surgery. If oculoplastic surgeons advocate these nonanatomical and nonphysiological procedures, certainly other groups would also be happy to clamp and remove posterior eyelid tissues, ignoring the anatomy and physiology of ptosis. The tarsus, conjunctiva, and Müller’s muscle do not cause ptosis and should not be removed to correct it. The Horner syndrome is the only ptosis caused by dysfunction of Müller’s muscle, and in these cases also, eyelid circumcision procedures do not work well.

I advocate that all oculoplastic surgeons return to the light side (anterior eyelid) and understand what they are doing to correct the anatomical problems that cause ptosis. Ptosis surgery can be simple and predictable (that is, predictable ptosis procedures) if you understand its anatomy and physiology. If your results are not immediately more esthetic, at least your surgical procedures will be more esthetically pleasing.

I have done several thousands of ptosis procedures. The majority are acquired ptosis and associated with an upper blepharoplasty in saggy eyelids with good levator function. These are simple and usually require only 1 suture to correct the anatomical problem. The rarefaction or disinsertion of the aponeurosis is obvious, if one looks at the aponeurosis after skin/muscle removal, and can be repaired with a 5-0 polygalactic 910 suture on a spatula needle through the blepharoplasty incision. The suture is placed at the desired high point of the eyelid near the medial limbus, fixating the aponeurosis to the superior anterior tarsus. The tarsal sutures are placed in this location as the desired eyelid crease is almost always in this position and is determined by the insertion of the aponeurosis on the tarsal plate. Temporal aponeurotic sutures are usually avoided in acquired ptosis with good levator function as they almost always lead to temporal flare. Precise anatomical correction with repair of the defect is paramount in these cases and almost always gives excellent results. Under local anesthesia, height, contour, eyelid lag in downgaze, eyelid crease and eyefold, and eyelash position can be further evaluated by asking patients to look up and down. Under general anesthesia, or when there is asymmetrical swelling, bruising or local anesthesia affecting levator function, precise anatomical aponeurotic correction is more difficult. In any ptosis surgery, the postoperative height may be slightly unpredictable and early adjustment should be possible and simple. I strive for slight overcorrection at the time of surgery in most acquired cases as there is some stretching with time and early massage will lower the eyelid. The 5-0 polygalactin 910 blue suture can easily be found and stretched or removed in the minor room by pulling the wound apart between the skin sutures in the first 2 weeks after operation if necessary. I use 6-0 interrupted plain gut sutures to close skin in my blepharoplasty and ptosis repairs, to allow egress of blood after operation. Excellent function, more than 10-mm in congenital ptosis cases, may also have aponeurotic defects and can be treated like acquired cases. If no defect is found, I usually resect 2.0 mm of aponeurosis/mm ptosis in excellent function ptosis cases.

The next most common ptosis repair in my practice is congenital ptosis with poor levator function. If a patient has less than 4 mm of levator function (I call this “no function”), the decision is simple since these patients require a frontalis suspension. I use 1-0 Gore-Tex suture (W.L. Gore & Associates, Flagstaff, AZ, USA) for virtually all slings placed in a pentagon fashion, and pass the suture behind the orbital septum (“septal pulley”) immediately below the orbital rim. The decision is also simple in congenital ptosis cases with only 4 mm to 5 mm of levator function. Permanent overcorrection is almost impossible. In this group I do a maximum aponeurotic resection suturing Whitnall ligament to the upper portion of tarsus (“Whitnall’s sling”) and usually combine this with a superior tarsectomy to

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give more height to the eyelid if the amount of lagophthalmos I induce on the operating table seems inadequate. This is the only time that I remove any tarsal plate in ptosis surgery, and I meticulously avoid taking conjunctiva above tarsus with its precious goblet cells and accessory lacrimal glands. I have never understood the logic in removing normal Müller’s muscle in any case, especially if it is the only muscle that provides function.

Neurologic and neuromyopathic ptosis cases are usually obvious, but must first be diagnosed and appropriately managed. Neuropathic cases, which are the most common in this group, should have aponeurotic resections until they progress to absent function, and then they will require the use of slings. Repeat surgeries are frequently needed in these progressive disorders. Horner syndrome is treated by aponeurotic resection, usually 2 mm/mm of ptosis, in cases with excellent levator function. The affected eyelid will generally appear lower than the normal eyelid in the morning and higher in the evening because of normal sympathetic tone on the opposite side. What happens to the contralateral eyelid after ptosis surgery must be considered before operation in all ptosis cases because Hering’s and Sherrington’s laws also apply to ptotic eyelids.

This leaves only congenital ptosis with a function between 6 mm to 9 mm for a decision on how much surgery to do. Crowell Beard also told me that “Ptosis will always remain an art rather than a science and therefore ptosis surgeons will always have a job.” I agree that ptosis still remains more of an art than a science in this small group, but I believe that aponeurotic ptosis surgery has made it much closer to a science in other groups. I combine all factors previously discussed in aponeurotic resections for this group. I have learned to strive for early overcorrections. Most 6-mm function cases are corrected with a Whitnall sling or a slightly less advancement. In 7- to 8-mm levator function cases, I resect 3 mm of aponeurosis/mm ptosis and in 9-mm function cases, I resect 2.5 mm/mm ptosis. I then evaluate height, contour, lagophthalmos, and suchlike, and adjust appropriately.

Facial asymmetry must be pointed out to all ptosis patients before operation as ptosis surgery alone will not correct all facial asymmetry. Ptosis is virtually always on the anatomically smaller side of the face. Ptosis surgery may actually make brow ptosis more obvious by altering eyelid-to-brow distance. This is more noticeable in cases of brow asymmetry. Obviously, good ptosis surgeons must also be esthetic surgeons, and patients with facial asymmetry may require slightly different eyelid heights and adjacent procedures at the same setting to achieve the desired cosmetic outcome. In many ptosis cases, the eyelid crease, eyelash position, and eyelid fold are more noticeable than the ptosis itself. These issues should be correctable and predictable at surgery, and it is easier to provide symmetry with bilateral surgery.

When I ask oculoplastic surgeons why they have gone to the dark side (posterior procedures), they agree that the levator and its aponeurosis are responsible for most ptosis cases and these are best visualized and their defects are best corrected by an anterior approach. However, they say the posterior eyelid circumcision is more predictable with fewer revisions in their hands. Some surgeons have noted up to 20% revisions with the anterior aponeurotic approach. This motivated me to review my personal results in all my ptosis cases in 1 year from January 1 to December 31, 2010. I performed 102 ptosis procedures in 2010, using the techniques described and referenced in this editorial. Only 3 eyelids required surgical revisions. This is less than 3%. I strongly doubt that the dark side can provide these results.

In summary, I advise all oculoplastic surgeons to return to anatomical and physiologic procedures for ptosis surgery and not give in to the dark side. You will get more esthetic results by doing more esthetic procedures. I have never understood why cutting out a functioning Müller’s muscle could be advocated for ptosis. Certainly we would not cut out the levator muscle and expect the levator function to improve or cut out a biceps muscle and think we will strengthen the arm. Removing goblet cells and accessory lacrimal glands or tarsus cannot help but damage the 3-layer tear film. Once you take out these precious eyelid structures, you cannot reverse the damage. Aponeurotic approaches (predictable ptosis procedures) are completely and simply reversible, and more logical and anatomical. I always advocate reversible procedures for ptosis. Aponeurotic surgery uses avascular planes rather than manipulating and resecting the highly vascular Müller’s muscle. In all surgeries, but especially esthetic surgery, first do no harm. Use your ophthalmic training and knowledge of orbital and eyelid anatomy to improve your results. Most of my blepharoplasty referrals from other specialties doing plastic surgery are for patients with ptosis or eyelid retraction. Do not go to the dark side and give away your ophthalmic training advantage. We have a competitive advantage over other specialties doing eyelid surgery; use it.

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Small Incision External Levator Repair: Technique and Early Results

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• PURPOSE: To describe a new surgical technique and early results of external levator repair performed through a small skin incision.

• METHODS: A chart review of consecutive patients undergoing small incision external levator repair was conducted. This modified external levator repair was performed through an 8-mm eyelid crease incision. Patients with unilateral or bilateral aponeurogenic blepharoptosis were candidates for the technique. Patients with excessive horizontal upper eyelid laxity and those requiring blepharoplasty in addition to blepharoptosis surgery did not undergo this technique. Patients who underwent previous upper eyelid surgery or concurrent brow surgery were excluded from the review. Preoperative measurements included upper eyelid margin reflex distance, levator function, and degree of dermatochalasis, as well as Goldmann visual field results. Outcome measures included incidence and type of intraoperative complications, postoperative upper eyelid position (including margin reflex distance, eyelid contour, and symmetry), incidence and type of postoperative complications, and revisions or additional necessary surgery.

• RESULTS: Twenty-eight eyelids of 17 patients met study inclusion criteria. Preoperative margin reflex distance ± SD averaged 0.8 ± 0.4 mm. Average length of follow-up was 28 ± 5 weeks (range, 15 to 52 weeks). No significant intraoperative complications occurred. Postoperative margin reflex distance averaged 3.7 ± 0.3 mm. Two eyelids were mildly undercorrected, and one demonstrated moderately peaked contour postoperatively. Satisfactory eyelid position and contour were achieved in 25 of 28 treated eyelids. No patient elected reoperation.

• CONCLUSIONS: Early results demonstrated that small incision levator repair is safe and generally effective. This minimally invasive external levator repair is useful for a carefully selected subset of patients with aponeurogenic blepharoptosis. (Am J Ophthalmol 1999;127:637–644. © 1999 by Elsevier Science Inc. All rights reserved.)

BLEPHAROPTOSIS IS A COMMON EYELID DISORDER. Dehiscence of the levator aponeurosis1–4 is most common origin of this condition in the adult patient. Numerous surgical techniques that correct aponeurogenic blepharoptosis through anterior1,2,5–13 and posterior approaches14–18 have been described. In ophthalmology, there is a progressive movement toward minimally invasive surgery. The goals of small incision surgery19 include decreased morbidity, tissue preservation, decreased operative time, rapid healing, and reduced scarring. We report a technique for small incision external levator repair of aponeurogenic blepharoptosis and present early results.

METHODS

A SURGICAL TECHNIQUE WAS DEVELOPED THAT ALLOWS external levator repair through an 8-mm skin incision. A retrospective analysis of patients who underwent the procedure was conducted. Patients with unilateral or bilateral aponeurogenic blepharoptosis presenting to an oculoplastics referral practice belonging to one of the authors (B.N.L.) were considered for the technique. Those needing skin or fat blepharoplasty and those with excessive horizontal upper eyelid laxity (for example, floppy eyelid syndrome) did not undergo this surgery. Patients with a history of upper eyelid surgery who underwent the technique and those who underwent concurrent brow surgery were excluded from the review. Informed consent was obtained from all patients before surgery.

Charts were reviewed for the following patient parameters: age, sex, presenting symptoms, preoperative eyelid measurements (margin reflex distance, levator function, and dermatochalasis), results of Goldmann visual field testing, intraoperative data (including number of sutures placed in each eyelid and occurrence of any complications), and postoperative parameters, including upper eyelid position (margin reflex distance), contour, symmetry,
complications, need for revision or additional surgery, and length of follow-up. All patients underwent preoperative and postoperative photography. A satisfactory result was considered to be correction within 1 mm of desired eyelid height with acceptable eyelid contour. Statistical analysis was conducted by means of a spreadsheet.

Patients underwent surgery in an outpatient surgery center under intravenous sedation with propofol (Diprivan; Zeneca Pharmaceuticals, Wilmington, Delaware). Local infiltrative anesthesia was achieved with 0.6 ml of lidocaine 2% with 1:200,000 units of epinephrine per eyelid. The horizontal placement of the skin incision site was carefully determined by elevating the eyelid with a cotton-tipped applicator at various horizontal positions along the eyelid crease and observing the resultant eyelid contour. An 8-mm segment of the eyelid crease was marked (Figure 1).

Dissection was performed with a microdissection needle powered by an electrosurgical unit. With the skin edges retracted by the assistant, dissection was carried through the pretarsal orbicularis. The superior half of the tarsus was exposed for a length of approximately 10 mm (Figure 2).

The assistant grasped the conjoined fascia at the septum’s insertion onto the levator aponeurosis and directed traction inferiorly and anteriorly. The surgeon similarly grasped the preseptal orbicularis and orbital septum and retracted superiorly and anteriorly. The orbital septum was incised above its fusion with the levator complex20,21 (Figure 3). The preaponeurotic fat pad was identified and retracted superiorly. Dissection was carried superiorly along the anterior surface of levator complex to a point several millimeters above the level of the musculoaponeurotic junction (Figure 4). Next, the inferior aspect of the levator aponeurosis was released from the underlying Müller muscle for approximately 5 mm. In bilateral cases, the levator aponeurosis was clamped with a small hemostat, and identical dissection of the contralateral levator complex was performed.

Before suture placement, eyelid contour was again carefully studied by elevating the tarsus at various horizontal positions with toothed forceps. After the ideal position for suturing was determined, a spatulated needle (S-24) on a 5-0 nylon suture (Ethicon #7731; Johnson and Johnson, Sommerville, New Jersey) was placed partial thickness through the tarsus in a horizontal fashion. The needle was then directed superiorly underneath the levator complex and retrieved on the anterior surface of the levator complex at or slightly above the musculoaponeurotic junction (Figure 5). A surgeon’s knot was placed and the suture loop partially tightened to provide an appropriate amount of lift (Figure 6).

The intravenous propofol was discontinued approximately 10 minutes before intraoperative assessment of eyelid position. This agent is rapidly inactivated by the liver. Rapid awakening occurred 10 to 15 minutes after discontinuing the infusion. With the patient’s cooperation, eyelid position and contour were inspected in primary gaze, upgaze, and downgaze. Suture tension was adjusted as necessary. Initial passage of the suture relatively high on the levator complex allowed the desired eyelid height to be achieved intraoperatively without complete tightening of the suture loop. (This “hang-back” technique allows for additional tightening of the suture when intraoperative assessment indicates the need for additional lift. If insufficient lift is achieved with a completely tightened suture, the suture is re-passed.) The suture loop was tied at the desired length over a needle holder (Figure 7). An additional suture was placed when needed to achieve the desired eyelid contour. The orbicularis was closed with a single, buried, interrupted suture of 7-0 polyglactin. The skin was closed in a running fashion with 6-0 fast-absorbing gut suture.

RESULTS

TWENTY-EIGHT EYELIDS OF 17 PATIENTS MET INCLUSION criteria for the study. Eleven patients were female; six were male. Mean age ±SD was 64.4 ± 10.2 years (range, 11 to 88 years). All patients were initially examined with visually marked blepharoptosis. Most commonly, patients reported difficulty driving or reading because of drooping upper eyelids (mean preoperative margin reflex distance, 0.8 ± 0.4 mm; range, −2.5 to +2.5 mm). The minimum levator function in the treated patients was 12 mm. Dermatochalasis was graded preoperatively with a scale of 1 (minimal) to 4 (skin resting on the lashes). Mean preoperative dermatomalaschis was 1.1 ± 0.3. Preoperative Goldman visual fields demonstrated a mean increase in superior visual field of 25 degrees with
the eyelids taped superiorly. A single suture of 5-0 nylon was used to secure the levator complex to the tarsus in 26 of 28 eyelids. In the other two eyelids, an additional suture was placed to achieve the desired contour. The only intraoperative complication was the inadvertent button-holing of a 4-mm segment of preseptal skin of one eyelid. This wound was sutured, and it healed without consequence.
Mean postoperative follow-up was 28.5 ± 5.0 weeks (range, 15 to 52 weeks). The postoperative margin reflex distance of the treated eyes averaged 3.7 mm (95% confidence interval, 3.4 to 4.0 mm). The mean postoperative margin reflex distance was statistically different from the preoperative margin reflex distance (P = .005, Student t test). The mean of the absolute value of the difference between the margin reflex distance of the right and left eyelid was 0.25 mm (95% confidence interval, 0.08 to 0.42 mm). Figures 8 and 9 demonstrate satisfactory results.

Two eyelids (7%) were undercorrected by slightly more than 1 mm. No eyelid was overcorrected. One eyelid demonstrated moderately peaked contour. Marked upper eyelid hooding occurred unilaterally in a patient with forehead ptosis, who declined recommended brow surgery.
Of 28 eyelids, both patient and surgeon were satisfied with position and contour in 25 eyelids (89%). No patient elected another operation.

DISCUSSION

LESS INVASIVE, YET EFFECTIVE, SURGICAL TECHNIQUES ARE of interest both to patients and surgeons. Decreasing incision length is one method of minimizing surgical trauma. This approach has been exploited effectively both in cataract surgery and in forehead lifting. Reduced incision size results in decreased damage to normal tissue and shorter recovery periods. Decreased operative time is frequently an additional benefit.

Since the reintroduction of external levator repair by Jones and associates in 1975,1 many variations of this technique have been reported.2,5–13 Posteriorly based techniques such as the Fasanella-Servat technique,15–18,22 Müllerectomy,23 or conjunctival Müllerectomy24–26 may also be used to correct acquired blepharoptosis. Advantages of external blepharoptosis surgery have been discussed elsewhere.8 Additionally, external levator repairs may also be accurately revised in the early postoperative period.13,27–29

Despite the many advantages of the external approach, it has some disadvantages.24 Although the eyelid skin usually heals well, the external approach may result in undesirable cutaneous scarring. External levator repair typically requires more dissection and operative time than conjunctival Müllerectomy. The recovery period after external blepharoptosis surgery is also generally longer. The current work grew out of a desire to improve these and other aspects of external levator repair while maintaining its advantages.

A smaller eyelid incision offers several advantages. Minimizing the amount of dissection reduces the amount of bleeding and edema. Less hemorrhage and edema allow more accurate assessment of eyelid position and function intraoperatively and possibly improved results postoperatively. Similarly, this less invasive approach requires less local anesthetic than standard techniques, reducing the likelihood of decreased levator function intraoperatively. When levator function is compromised intraoperatively, judgment of the surgical endpoint becomes extremely difficult. This technique also requires less operative time than a full-incision external levator repair. Decreased edema and ecchymosis allow shortened recovery time. If additional eyelid surgery is necessary in the future, a reduced degree of scarring would be a significant advantage.

Although this study was conducted in a retrospective fashion, care was taken preoperatively to select the most appropriate patients. This technique was reserved for patients with aponeurogenic blepharoptosis and good to excellent levator function. It is well recognized that raising the upper eyelid with any type of blepharoptosis surgery tends to make preexisting dermatochalasis more apparent. The procedure described does not include skin or fat blepharoplasty. For this reason, the technique was restricted to patients with mild to minimal dermatochalasis. Before undertaking this technique, we anticipated that most eyelids would receive one nonabsorbable suture adjoining the levator complex to the tarsus. To minimize the risk of abnormal postoper-
ative eyelid contour, patients with excessive horizontal laxity or tarsal instability (for example, floppy eyelid syndrome) were not considered for this technique. The 8-mm incision we used does not provide the broad perspective of the upper eyelid structures given by a full eyelid crease incision. Therefore, a precise understanding of the upper eyelid anatomy is required for this procedure. Incision size was incrementally decreased before arriving at the current technique. In early cases, isolation of the levator complex was occasionally challenging; however, in all cases the levator was isolated unequivocally. Conversion to a larger skin incision for increased surgical exposure was not required in any of the 28 eyelids reported or in any subsequent small incision levator repairs performed to date by the authors. Additionally, the surgical technique was safe.

Severe blepharoptosis was corrected with this technique. Preoperative margin reflex distances averaged 0.8 mm (95% confidence interval, 0.4 to 1.2 mm), and all patients initially had visual symptoms. The postoperative margin reflex distance of the treated eyes averaged slightly less than 4 mm. It should be noted that some patients were targeted for final margin reflex distances of less than 4 mm. The technique should not be regarded as a minimal operation for minimal degrees of blepharoptosis. In fact, cases of blepharoptosis of less than 2 mm that are responsive to phenylephrine are probably better treated with a posteriorly based technique.

The eyelid heights were also quite symmetric postoperatively. The difference between margin reflex distances averaged 0.25 mm. (To avoid neutralizing overcorrections and undercorrections by averaging, absolute values of the difference between the margin reflex distance of the right and left eyelids were utilized).
Not all postoperative results were ideal with this technique. Two eyelids (7%) were undercorrected by slightly more than 1 mm and were considered complications. Neither patient desired surgical revision. Similarly, the patient with moderately peaked contour was aware of the abnormality but declined a proposed revision. Patients with significant untreated brow ptosis are not good candidates for this technique. Although worsening of uncorrected brow ptosis postoperatively (with resultant exacerbation of dermatochalasis) is not unique to this technique, an external levator repair with limited blepharoplasty is a better alternative. Ideally, surgery in such patients should also address the brow abnormality.

Defining a satisfactory result after blepharoptosis surgery is difficult. Generally, correction within 1 mm of the desired height is considered successful.7,8,11,12,28,30,31 However, as Liu12 noted, some patients are pleased with results outside this target zone, and others with correction within 1 mm of symmetry may be unhappy with the result. This criterion does not account for eyelid contour, which is an important aesthetic component of a satisfactory result.

Overall, this small incision external levator repair resulted in eyelid position and contour satisfactory to patient and surgeon in almost 90% of treated eyelids. No patient elected additional surgery. In terms of resultant eyelid position, these preliminary results compare with reported success rates of 71% to 96%.8,11–13,28,30 –32 The safety and adequacy of one-suture fixation in external levator repair has been demonstrated.12

This study has several limitations. Strict preoperative patient selection limited the number of patients undergoing this technique. The study is not prospective and carries the attendant limitations of any retrospective analysis. The average follow-up of 6 months must be considered preliminary. Previous work by Linberg30 showed that the result at 1 week after external levator repair closely approximates the result at 3 months. Similarly, results from a closely related external levator technique12 demonstrated the stability of early results, with an average follow-up of 5 years.

Despite these limitations, the results of this study are encouraging. This small incision technique of levator repair corrected severe aponeurogenic blepharoptosis in a properly selected subset of patients with infrequent and minor complications. The early results of this study demonstrate that small incision external levator repair is a safe and effective technique.

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Efficacy and Efficiency of a Small-Incision, Minimal Dissection Procedure versus a Traditional Approach for Correcting Aponeurotic Ptosis

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Objective: To compare the efficacy and efficiency of a new small anterior incision, minimal dissection ptosis procedure with that of a traditional anterior aponeurotic approach for the correction of aponeurotic ptosis.

Design: Retrospective, comparative, interventional case series.

Participants: Seventy-two patients with aponeurotic ptosis who had undergone ptosis correction surgery by 1 surgeon: 36 patients (49 ptotic eyelids) who had ptosis correction by a small-incision, minimal dissection procedure and 36 patients (49 ptotic eyelids) who had ptosis correction by a traditional aponeurotic approach.

Methods: Charts and available photographs were reviewed for each patient.

Main Outcome Measures: Postoperative upper eyelid height relative to the center of the pupil and relative to the opposite upper eyelid and the postoperative eyelid contour.

Results: Successful correction of the eyelid height and the rate of recommended reoperation were not significantly different for the 49 lids corrected in each arm of the study. The incidence of attaining good eyelid contour was significantly better in the small incision group, in which 41 of 42 lids (97.6%) evaluated by photographs had good contour compared with 29 of 37 lids (78.4%) in the traditional group. Operating time per lid was significantly less for the small-incision, minimal dissection group, 25.3±13.0 minutes (range, 13–68 minutes) compared with 55.4±16.6 minutes (range, 35–119) for the traditional group.

Conclusions: The small-incision, minimal dissection technique for ptosis correction is equally effective in correcting eyelid height, superior in producing desirable eyelid contour, and much quicker to perform than the traditional aponeurotic approach. Ophthalmology 2004;111:2158–2163 © 2004 by the American Academy of Ophthalmology.

Shortly after the concepts of aponeurotic ptosis and aponeurotic surgery to correct it were introduced by Jones et al1 in 1975, the concepts were accepted and surgery for acquired ptosis changed.1–3 The traditional dissection for aponeurotic ptosis correction involves a lid crease incision approximately 20 to 22 mm long. Through this skin incision, dissection is carried superiorly under the orbicularis oculi muscle across the width of the incision. When the orbital septum is identified, it is opened widely to expose the orbital fat. With the fat lifted back or excised, the levator aponeurosis is exposed. Inferiorly, the anterior surface of the upper half of the tarsal plate is cleared across the same width, either by excising overlying orbicularis oculi muscle or dissecting underneath it. The aponeurosis then can be resected or tucked, suturing it to the exposed tarsal plate, commonly with 3 sutures. The patients in this study operated on with the traditional dissection were resected.

We present here a small-incision, minimal dissection procedure (SIMD) for aponeurotic ptosis correction as originally conceived by one of the authors (HMcD). The results of using the SIMD approach are presented and are compared with those obtained by the same surgeon (BRF) using the traditional dissection (TD).

Patients and Methods

The criteria for inclusion in this study included (1) a diagnosis of aponeurotic ptosis, (2) surgical correction with either the SIMD method or the TD method, (3) surgery performed by 1 surgeon (BRF) with a resident or fellow participating in the procedure, and (4) follow-up conducted by the primary surgeon. Exclusion criteria included previous surgery on the ptotic eyelid, concomitant surgery performed at the time of ptosis repair, and a follow-up period...
of less than 2 months. Before gathering the data, a successful outcome was defined as each lid being within 0.5 mm of the other and the operated lid being within 2 to 4 mm above the center of the pupil with the patient looking in the primary position.

Fifty-one charts of consecutive patients who underwent the SIMD procedure between July 2001 and July 2003 were reviewed. Fifteen patients were excluded: 6 had insufficient follow-up, 5 had concomitant surgery, 2 were reoperations, and 2 were determined to have had an underlying cause other than aponeurotic ptosis. This left 36 patients for the study, 13 of whom had bilateral surgery. Sixty-three charts of nonconsecutive, haphazardly chosen patients who underwent the TD procedure between March 1990 and December 1996 were reviewed to come up with an equal number of patients with the same incidence of bilaterality as in the SIMD group. Twenty-seven patients were excluded: 10 had inadequate follow-up, 10 had undergone concomitant surgery, 4 were reoperations, and 3 were determined to not have aponeurotic ptosis. After reviewing the first 61 charts, 23 unilateral and 12 bilateral cases were selected. Only bilateral cases were then reviewed to obtain the thirteenth bilateral case. No charts for the interval from January 1997 through June 2001 were reviewed because the surgical methodology used in that interval did not meet the selection criteria.

Information recorded on each patient in the study included age, gender, previous surgery on the operated side, side(s) having ptosis, preoperative and postoperative distance of each lid above the center of the pupil, number of sutures used, surgical time, whether reoperation was recommended, and lid contour (judged from postoperative photographs). The study protocol was approved by the University of Michigan’s Institutional Review Board.

Small-Incision, Minimal Dissection Procedure

With the patient in the supine position on the operating table, he or she is asked to look straight ahead, up at the ceiling. A vertical line is drawn on the upper lid, in line with the center of the pupil. Another line is drawn in the lid crease, centered on the vertical line and approximately 8 to 10 mm long. Local anesthetic, an equal mixture of 1.0% lidocaine (Xylocaine, AstraZeneca, Wilmington, DE) with epinephrine 1:100,000 and 0.75% bupivacaine, is infiltrated beneath the skin of the lid crease marking. The anesthetic needle is then passed vertically through the vertical lid marking, as high as it will reach, and then is curved forward and brought out at the center of the pupil, number of sutures used, surgical time, whether reoperation was recommended, and lid contour (judged from postoperative photographs). The study protocol was approved by the University of Michigan’s Institutional Review Board.

Statistical Methods

Comparison between groups of patient-level data (age, gender, etc.) made use of 2-sample independent statistical tests (e.g., Student’s t-test and the chi-square test). Because lid height contrasts involved data from 26 eyelids of 13 patients who had bilateral procedures and 23 eyelids from 23 patients who had unilateral procedures in each group, comparisons of means treated subjects as a random effect and thereby adjusted for intereye dependency, using SAS Proc Mixed software. For comparisons of frequencies between groups, the generalized estimating equation was used to adjust for intereye dependency using SAS Proc Genmod software.

Results

In the SIMD group, the criteria of the lids being within 0.5 mm of each other and the operated lid being between 2 and 4 mm above the center of the pupil were met for 24 of the 36 patients (66.7%). In the TD group, using the same the criteria, they were met in 22 of 36 patients (61.1%). This measure of clinical success was not significantly different in the 2 groups.

The lid height difference after surgery was ≤0.5 mm in 27 patients (75%) in the SIMD group. The lid height difference after surgery was ≤0.5 mm in 23 patients (63.9%) in the TD group. The frequency of the eyelids being within 0.5 mm of each other was not
significantly different in the 2 groups. If we assume that a 64% success rate is expected using the traditional incision approach, we had sufficient power (82%) with 36 patients in each group to detect a beneficial impact of the small incision approach if 94% (34 patients) showed symmetry of lid height using the new approach.

A clinical decision to recommend reoperation in the SIMD group was made for the 9 patients (25%) who showed >0.5 mm difference in eyelid height. In the TD group, clinical decision for reoperation was made in 11 patients (31%), 9 of whom showed more than 0.5-mm difference in eyelid height, 1 bilateral patient in whom each lid was similarly low, and 1 patient in whom the central lid height was fine but the lid was low medially. The incidence of recommending reoperation was not significantly different in the 2 groups. If we assume that a 31% reoperation rate is expected using the traditional incision approach, we had sufficient power (83%) with 36 patients in each group to detect a beneficial impact of the small incision approach if no patient required reoperation using the new approach.

Of the 49 lids operated on with the SIMD procedure, 34 received 1 suture, 9 received 2 sutures, all placed laterally, and 6 received 3 sutures. Of the 49 lids operated on with the TD procedure, 2 received 1 suture, 3 received 2 sutures, all placed medially, and 44 received 3 sutures.

In the SIMD group, 41 of 42 lids of 32 patients had a normal eyelid contour, as judged from postoperative photographs. In the patient with an abnormal contour, the lid was lower laterally and

![Figure 1](image_url). The steps from dissection through the orbicularis to passing the needle through the aponeurosis are shown in cross section. A, After incising the skin, the orbicularis is spread bluntly to expose the aponeurosis over the midtarsal plate. B, The aponeurosis is incised. C, Dissection is carried bluntly superiorly posterior to the aponeurosis. D, The suture is passed through the dissected space through the posterior surface of the aponeurosis and out through the anterior surface, posterior to the orbicularis oculi muscle.
Discussion

The SIMD ptosis correction procedure is easy to perform and to teach. The minimal dissection lessens anatomical disruption and probably explains the significantly higher rate of good eyelid contour outcome. It is a procedure that is applicable mainly to eyelids that have not had previous lid surgery or trauma, because the anatomy should be in its original state to allow the blunt dissection. The first pass of the needle through the aponeurosis is nearly always effective in securing it, but always should be checked by having the patient look up. One suture was sufficient in 69% of the patients, and all had a good contour outcome. The dissection to add a second suture is quick: of the 9 patients requiring 2 sutures, the time of operation was less than the mean time in 5 patients and only 1 of the others was an outlier, at 50 minutes. Of the 6 patients requiring 3 sutures, 4 were outliers, requiring 50 minutes, 68 minutes, and a bilateral case averaging 61 minutes per side. The extra time spent on these outliers suggests there was difficulty obtaining a satisfactory contour, although the only nonsatisfactory contour was in 1 lid of a bilateral patient with 3 sutures per side but averaging 32 minutes per side.

A note of caution pertains to the lack of significance found for differences between incision approaches for lid symmetry and rates of recommended reoperation. For both outcomes, our sample size was insufficient to detect anything other than a major beneficial effect of the small incision approach. Therefore, the fact that both outcomes were slightly better for the small incision group, although encouraging, should not be relied on as a basis for promoting this surgical approach.

Using a single suture for aponeurotic ptosis correction was introduced by Liu5 in 1993. Meltzer et al8 in 2001 presented excellent results with an adjustable single suture. Lucarelli and Lemke7 published the first small-incision ptosis procedure and used primarily a single suture, adding additional sutures as needed. However, their dissection was similar to the traditional dissection, with finding and opening the orbital septum, retracting the fat to identify the levator aponeurosis, cutting the aponeurosis from Müller’s muscle, and then attaching it to the tarsus. They state that the procedure requires less operative time than a full-incision external levator repair, but no data were provided.

Although this is a retrospective study, complete data were found for every aspect studied except for postoperative photographs used to judge eyelid contour. Photos were available for 89% of the SIMD group and 75% of the TD group. Circumstance (the photography department was closed) or an error of omission rather than bias accounts for the incomplete availability of photographs, because it is our policy to obtain photographs of every postoperative ptosis correction patient at the 2-month postoperative visit. The photograph evaluator (BRF) was not masked to the surgical method used; evaluation by a different, masked, observer would have been preferable. To comply with institutional review board and Health Insurance Portability and Accountability Act of 1996 regulations, and to avoid the need to contact each subject for permission, each chart and the accompanying photos were examined and the data recorded, and then the records were returned, with no link remaining to connect the data collected to the patient. We believe the drawbacks of less than complete availability of photographs and nonmasked evaluation do not change the conclusion that good contour was achieved in a higher percent of the SIMD group than of the TD group.

Although follow-up time was not contrasted between groups, all patients had a minimum of 2 months of follow-up. For the past 15 years, based on prior experience, when a patient has adequate lid position at 2 months, they are discharged from care. This approach is supported by the data of Doxanas,8 who followed up 150 patients for a minimum of 3 years and up to 5 years and reported no case of late recurrence. If patients were overcorrected or undercorrected, this was evident 1 week after surgery in his patients. Berlin and Vestal9 did report 15 failures in 62 patients occurring after the 6-week visit when using a 6–0 polyglactin suture. Absorbable suture use in aponeurotic ptosis correction can lead to late failure, and this knowledge had led the surgeon (BRF) to sole use of permanent sutures for aponeurotic ptosis correction.

Table 1 shows the outcomes of 11 studies2,5–14 in relation to meeting their criteria for successful lid position when operating on aponeurotic ptosis. Only 29,10 of the 11 reports defining success specify not only a maximum difference in lid height but a range above the pupil that is acceptable. These 2 papers presented the most detailed and useful information on surgical outcome relative to our outcomes. Although Table 1 shows specific success rates for the report by McCulley et al,10 these are estimates, with a range of success within a 95% confidence limit of 71% to 83% for unilateral patients and 67% to 82% for bilateral patients. The success rates of McCulley et al10 and Berlin and Vestal9 are similar to ours, given our tighter criteria for lid difference and maximum acceptable eyelid height. It seems important that both difference in lid height and an acceptable range of lid position should be specified truly to define success. Clearly, 2 lids that bisect the center of the pupil after surgery represent failed operations, although there is no difference between the height of the 2 lids.

The acceptable difference in lid height above the center of the pupil was 1.0 mm in most of the reports. One report12 found a difference of 1.5 mm acceptable for a successful operation. Using that criterion, 20 of our 72...
patients, or 28%, did not need surgery in the first place. That same report had data imbedded that showed that the success rate dropped from 90.1% to 83.1% if, rather than a 1.5-mm difference, a 1.0-mm difference was used and success rate dropped from 90.1% to 83.1% if, rather than 0.5-mm difference was used. Only 1 paper6 mentioned success as being within 0.5 mm. The success rates for McCulley et al are estimates with a range, so no numbers meeting criteria are given.

The outcome of SIMD ptosis correction in terms of eyelid height is similar to that of the TD dissection. Success in achieving a good eyelid contour is significantly greater with the SIMD procedure. The SIMD procedure requires significantly less time to perform. These findings should make the SIMD ptosis correction procedure the aponeurotic surgical procedure of choice for correcting previously un-operated aponeurotic ptosis.

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**References**