New Insights Into Physical Findings Associated With Postblepharoplasty Lower Eyelid Retraction

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Aesthetic Surgery Journal 2014 34: 995
DOI: 10.1177/1090820X14544306

Aesthetic Surgery Journal
2014, Vol. 34(7) 995–1004

DOI:10.1177/1090820X14544306
www.aestheticsurgeryjournal.com
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New Insights Into Physical Findings Associated With Postblepharoplasty Lower Eyelid Retraction

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Abstract

Background: Postblepharoplasty lower eyelid retraction (PBLER) has been linked to anterior lamellar shortage, unaddressed eyelid laxity, and middle lamellar scarring. The authors believe there are other, less-appreciated physical findings (orbicularis weakness, negative-vector eyelid, and inferior eyelid/orbit volume deficit) that also influence the development and potentially the management of this complex type of eyelid malposition.

Objectives: To better understand PBLER, potentially prevent its development, and improve treatment options, the authors determined the incidence of various physical findings present on initial examination of patients referred for PBLER revision.

Methods: The medical charts of patients referred for PBLER revision over a 21-month period were reviewed. The presence of anterior lamellar shortage, lower eyelid laxity, and a middle lamellar (internal eyelid) scar was documented. Orbicularis weakness, negative-vector eyelid topography, and volume deficiency of the lower eyelid/inferior orbit also were noted. The incidence of each finding was calculated.

Results: Forty-six patients (35 women, 11 men) were included. All patients had undergone primary transcutaneous surgery, which led to the eyelid retraction. Orbicularis weakness, anterior lamellar shortage, inferior eyelid/orbital volume deficit, negative-vector eyelid topography, and eyelid laxity were common. A middle lamellar scar of significance was found in only 17% of eyelids.

Conclusions: The data suggest that the aforementioned underappreciated findings are common in patients with PBLER. Evaluating these factors when planning primary blepharoplasty may reduce the incidence of PBLER. Awareness of these findings when planning revisional procedures may improve surgical outcomes.

Level of Evidence: 4

Keywords

blepharoplasty, eyelid retraction, eyelid vector, orbicularis weakness, eyelid volume, eyelid scar, eyelid laxity

Accepted for publication May 23, 2014.

Treatment of postblepharoplasty lower eyelid retraction (PBLER) is challenging.[1] Historically, this type of eyelid malposition has been linked to transcutaneous surgery and 3 primary etiologic factors: overzealous excision of skin, unaddressed eyelid laxity, and middle lamellar scarring.[2-5] Contemporary approaches to aesthetic lower eyelid rejuvenation have evolved in a manner paralleling the awareness of these issues. This awareness, coupled with appropriate precautions and interventions to prevent lower eyelid retraction, has significantly reduced the incidence of PBLER,[6-14] but the problem still occurs.[1] This led the authors to question whether traditional perceptions of factors associated with PBLER provide a complete picture of the problem. It is the anecdotal belief of the senior author (G.G.M.), who has treated many patients with PBLER, that less-recognized factors also

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contribute to this type of eyelid malposition, including reduced orbicularis function, negative-vector eyelid topography, and volume deficiency of the inferior eyelid/orbit.

To identify the incidence of potential etiologic factors present on initial evaluation of patients with PBLER, the authors retrospectively evaluated patients treated for this condition in the senior author's practice during a 21-month period. We believe the data attained may help in preoperative primary blepharoplasty assessment in order to reduce the incidence of PBLER and in allowing better decision making when attempting to address this complex problem.

METHODS

A retrospective chart review was performed of patients with PBLER referred to the senior author's private practice for revisional surgery between January 2011 and September 2012. Each chart was evaluated by 2 authors (G.G. and G.G.M.) for the presence of 6 potential contributors to PBLER: reduced orbicularis strength, a middle lamellar scar, anterior lamellar shortage, lower eyelid/inferior orbital volume deficiency, negative-vector eyelid topography, and lower eyelid laxity. The chart review was conducted in accordance with standards of the Declaration of Helsinki and was compliant with the Health Insurance Portability and Accountability Act.

Inclusion criteria were a history of ≥1 lower eyelid blepharoplasty procedure and the presence of lower eyelid retraction on initial evaluation in at least 1 eye. Patients with a known history of previous eyelid trauma, orbital surgery, thyroid disease, inflammatory eyelid/orbital disease, or facial nerve pathology were excluded, as were patients who presented within 3 months of primary blepharoplasty. Lower eyelid retraction was defined as the presence of scleral show (which each patient stated was not present before primary blepharoplasty) on primary gaze (Figure 1A). Our ability to accurately determine the amount of eyelid retraction that developed after original blepharoplasty was limited by the lack of presurgical evaluation data. However, each patient complained of "droopy" lower eyelids after surgery and was referred for treatment of this problem. The amount of lower eyelid retraction was measured by assessing the margin reflex distance 2 (MRD2), which is the distance in millimeters from the corneal light reflex to the lower eyelid margin in primary gaze (Figure 1A).[15] For all patients, this was measured manually by the senior author with a millimeter ruler. The methods for evaluating each of the 6 potential etiologic parameters are described below.

Orbicularis Strength

The authors previously described a method for subjective grading of orbicularis strength on a scale of 0 to 4, whereby a numeric value is assigned based on the ability of the examiner to pry open the patient's eyelids during forceful closure by the patient (Figure 1B).[16] A normal score (4) is assigned if the examiner cannot open the patient's eyelids. Scores of 3, 2, and 1 correspond (respectively) to slight, moderate, and significantly reduced strength of the eyelids. A score of 0 denotes no orbicularis function. For this study, we simplified the measurement to a binary scale: normal strength (a 4 on the previous scale) and reduced strength (<4 on the previous scale). This evaluation can identify orbicularis weakness of the upper or lower eyelid. However, only the lower eyelid was examined in this study.

Middle Lamellar (Internal Eyelid) Scar

Middle lamellar scarring was determined by the forced traction test, whereby the patient is asked to look up while the examiner manually displaces the lower eyelid superiorly (Figure 1C,D).[17] Normally, the lower eyelid easily stretches upward to cover the entire cornea and close the eye. If the lower eyelid was restricted mechanically from moving upward, an internal eyelid scar was noted. Because anterior lamellar shortage also can affect upward mobility of the eyelid, an eyelid scar of significance was considered present when the limitation of movement appeared out of proportion to the amount of skin shortage.

Anterior Lamellar Shortage

While looking upward, the patient is asked to open his or her mouth. If an increase in lower eyelid retraction was observed or if frank ectropion was induced by this maneuver, anterior lamellar shortage was considered present (Figure 2A,B).

Volume Deficiency of the Lower Eyelid/Inferior Orbit

Volume deficiency was determined by subjective assessment of hollowing (significant concavity) of the lower eyelid. If lower eyelid hollowing was present, the eyelid was considered volume deficient (Figure 2C,D).

Negative-Vector Eyelid

The patient's profile was examined (sagittal view). If the cornea projected more anteriorly than the midface, the patient was considered to have a negative-vector eyelid (Figure 2E,F).

Lower Eyelid Laxity

Lower eyelid laxity was assessed by the eyelid snap and distraction tests. For the snap test, the lower eyelid was pulled inferiorly by the examiner and allowed to snap back into place. Normally, this should occur quickly and without blinking. If the eyelid returns to its baseline position slowly or

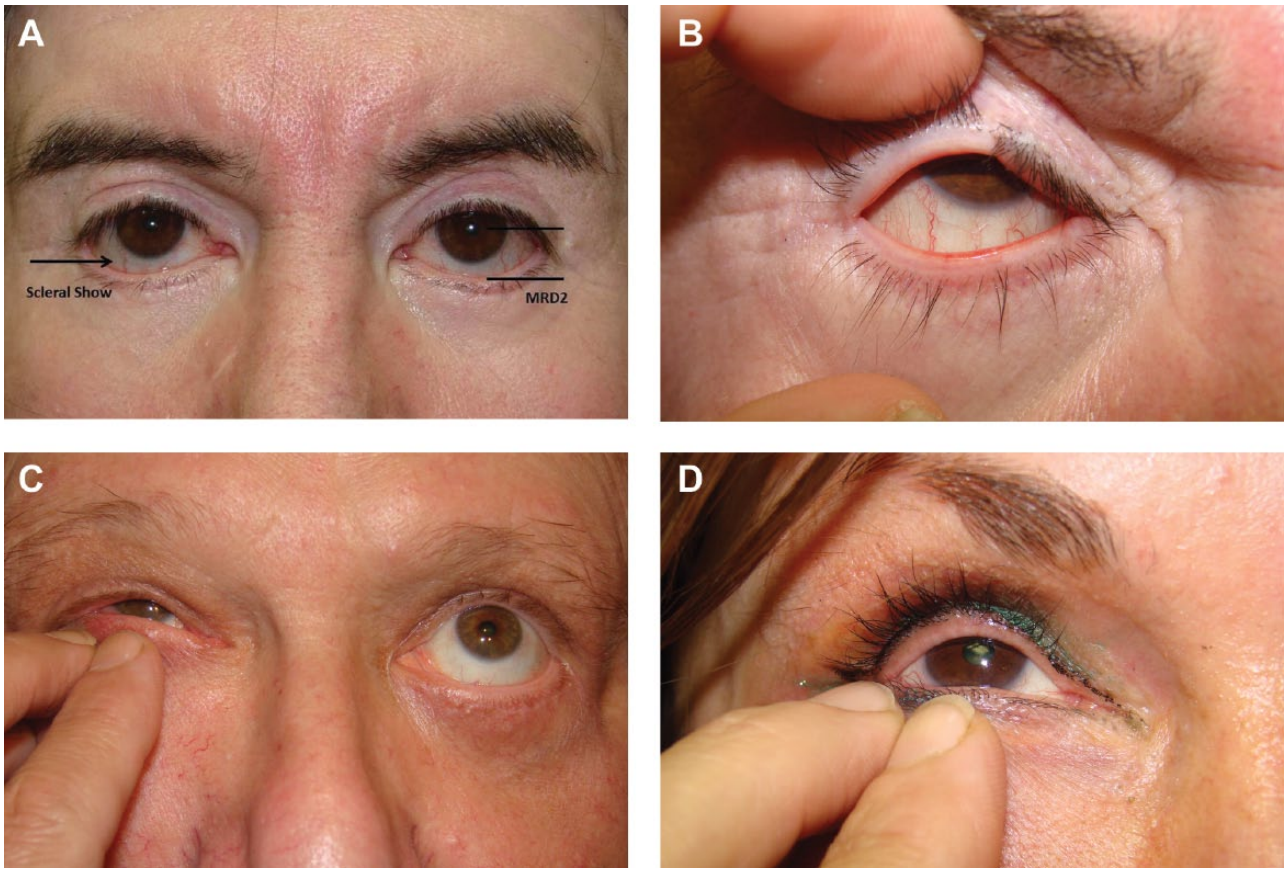

Figure 1. (A, B) This 52-year-old man presented with bilateral postblepharoplasty lower eyelid retraction 18 months after upper and lower blepharoplasty. (A) Scleral show is visible between the inferior iris and lower eyelid margin. The MRD2, which is the measured distance in millimeters between the corneal light reflex and the central lower eyelid margin, is represented by the area between solid black lines. (B) Orbicularis strength was assessed by attempting to open the patient's eyes during forceful closure by the patient. The patient exhibited significantly reduced orbicularis strength. (C) Internal eyelid scarring was assessed by the forced eyelid traction test in which the lower eyelid was displaced superiorly by the examiner. This 64-year-old man presented 14 months after lower blepharoplasty with minimally limited forced eyelid elevation. (D) Nine months after blepharoplasty, this 68-year-old woman presented with moderate eyelid tether, as demonstrated by the forced traction test. If skin shortage is present, there may be mild or moderate resistance to eyelid elevation, not to be confused with an eyelid scar of significance in which case resistance to forced eyelid elevation would be more significant. The forced eyelid traction test result was considered positive if frank mechanical resistance was noted.

incompletely, or requires a blink, the snap test result is abnormal (positive). For the eyelid distraction test, the lower eyelid is pulled away from the surface of the globe. If the eyelid can be pulled more than 10 mm from the cornea, the test result is abnormal (positive). Positive findings indicate eyelid laxity. Although both tests are utilized to determine eyelid laxity, the snap test is more helpful for measuring orbicularis tone, and the distraction test is more beneficial for assessing canthal tendon integrity.[18]

RESULTS

Forty-six patients (35 women, 11 men) met the inclusion criteria and were evaluated. Thirty-five patients (76%) had bilateral lower eyelid retraction and 11 (24%) had unilateral retraction. Therefore, the study included 81 eyelids. The mean patient age at presentation was 56 years (range, 42-68 years). The mean time between the last blepharoplasty and presentation was 9 months (range, 4-26 months).

In all cases, the blepharoplasty procedure that led to PBLER was performed transcutaneously. Orbicularis weakness was present in 40 (87%) of the 46 patients and in 70 (86%) of the 81 eyelids. Anterior lamellar shortage was present in 36 patients (78%) and 64 eyelids (79%). These were the most common etiologic factors identified. Volume deficit of the inferior eyelid/orbit was present in 32 patients (70%) and 64 eyelids (70%); negative vector was noted for 28 patients (61%) and 53 eyelids (65%); and eyelid laxity

Figure 2. Anterior lamellar shortage was assessed by having the patient look upward with the mouth ajar. If the lower eyelid retracted further or became frankly ectropic, a skin deficit was deemed present. (A, B) This 57-year-old woman presented 15 months after lower blepharoplasty. A skin deficit was evident when she looked upward while opening her mouth. (C, D) Frontal and oblique views (respectively) of this 56-year-old man, obtained 12 months after lower blepharoplasty, demonstrate inferior eyelid/orbit volume deficit. (E, F) Examples of negative-vector eyelid configuration: (E) the same man shown in panel C and (F) a 62-year-old woman who presented 14 months after lower blepharoplasty.

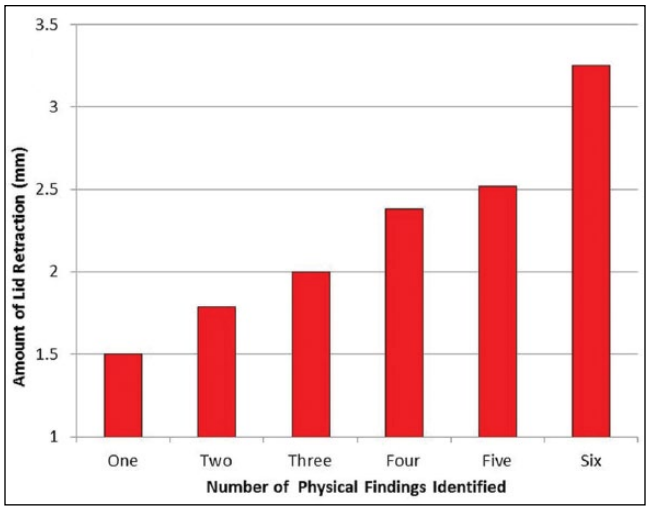

Figure 3. Findings from our retrospective review showed that greater amounts of eyelid retraction corresponded to more physical risk factors for eyelid retraction.

was observed in 29 patients (62%) and 50 eyelids (62%). Internal eyelid scars of significance were relatively uncommon, identified in only 8 patients (17%) and 14 eyelids (17%). Most patients exhibited 4 (n = 17) or 5 (n = 14) of the 6 factors potentially contributing to eyelid retraction. The average amount of retraction was 2.3 mm, with a trend toward greater retraction in patients who had more etiologic factors (Figure 3). As a result of some inaccuracies in details of patient histories and collection of medical records, it was not possible to assess the relationship between eyelid retraction and the number of previous operations.

DISCUSSION

Lower eyelid retraction is one of the most feared complications of lower blepharoplasty surgery. The attendant scleral show and rounding of the eye are poorly tolerated by patients from a cosmetic and often functional standpoint.[1,2,13,19-21] The senior author of the present study (G.G.M.) is an oculoplastic specialist who practices in an affluent urban setting, where a high volume of cosmetic eyelid surgery is performed. Patients with PBLER are commonly referred to his practice. The surgical correction of postsurgical eyelid retraction can be challenging as well as frustrating. Standard contemporary procedures to address this problem involve some combination of midface lifting, open canthal suspension, and posterior lamellar stenting with either an autologous or homologous spacer graft.[13,14,19-21] This surgical plan has developed in response to the presumed mechanism of the eyelid malposition, primarily attributed to eyelid laxity, anterior lamellar deficit, and middle lamellar scarring.[2-5] However, the plan has not yielded reliable or consistent outcomes in our experience. In an ongoing study, we are comparing physician and patient satisfaction with outcomes in all forms of revisional eyelid and periorbital surgery.[22] An assessment of PBLER corrective surgery with the aforementioned combination of procedures is included in that study. A preliminary review of the data has shown that only 40% of patients are satisfied with their surgical outcome,[22] which is well below the standard for which we aim. This prompted us to critically evaluate our PBLER patient population for incidence of physical findings at presentation that may contribute to the eyelid malposition. The goal is to incorporate these data when planning primary blepharoplasty to potentially reduce the incidence of PBLER and to better understand and potentially treat the problem when it occurs.

Before applying the study findings, it is essential to understand which anatomic structures maintain lower eyelid position in its native state.[19] We have isolated the component variables that support the lower eyelid. The lower eyelid is maintained laterally and medially by its respective canthal tendons, inferiorly by the eyelid fat pads and bony projection of the maxilla, and anteriorly by the dynamic sphincteric action of the orbicularis oculi. An adequate amount of vertical eyelid skin also is needed to support native eyelid position.[21-23] Deficits in any of these areas, whether involutional or iatrogenic (from surgery), may predispose the patient to eyelid retraction. It is critical to assess these variables individually before performing lower blepharoplasty, so that any factor that may adversely affect outcome is identified and accounted for in presurgical planning and other decision making.

In addition to the 3 traditionally known contributors to postsurgical eyelid retraction (lower eyelid laxity, anterior lamellar deficiency, internal eyelid scar), we evaluated 3 other potential factors: orbicularis weakness, inferior eyelid/orbital volume deficit, and negative-vector eyelid topography. These 3 factors were selected based on our observation that they are at least as common as the factors traditionally believed to be pivotal to the development of PBLER.

Our first significant finding was that all referred patients developed this complication after having undergoing primary transcutaneous surgery, which is not surprising, as this surgical approach has been associated with lower eyelid retraction.[2,11-14,18-24] We believe that with proper preoperative assessment, the addition of protective surgical adjuncts, and the hands of a skilled surgeon, transcutaneous lower blepharoplasty is safe and effective. It is also noteworthy that no patient in this study had undergone primary transconjunctival surgery.

This data must be evaluated in perspective. It has been reported that transcutaneous blepharoplasty can lead to lower eyelid retraction in up to 20% of cases.[24] These patients are the population represented in our study—not patients who

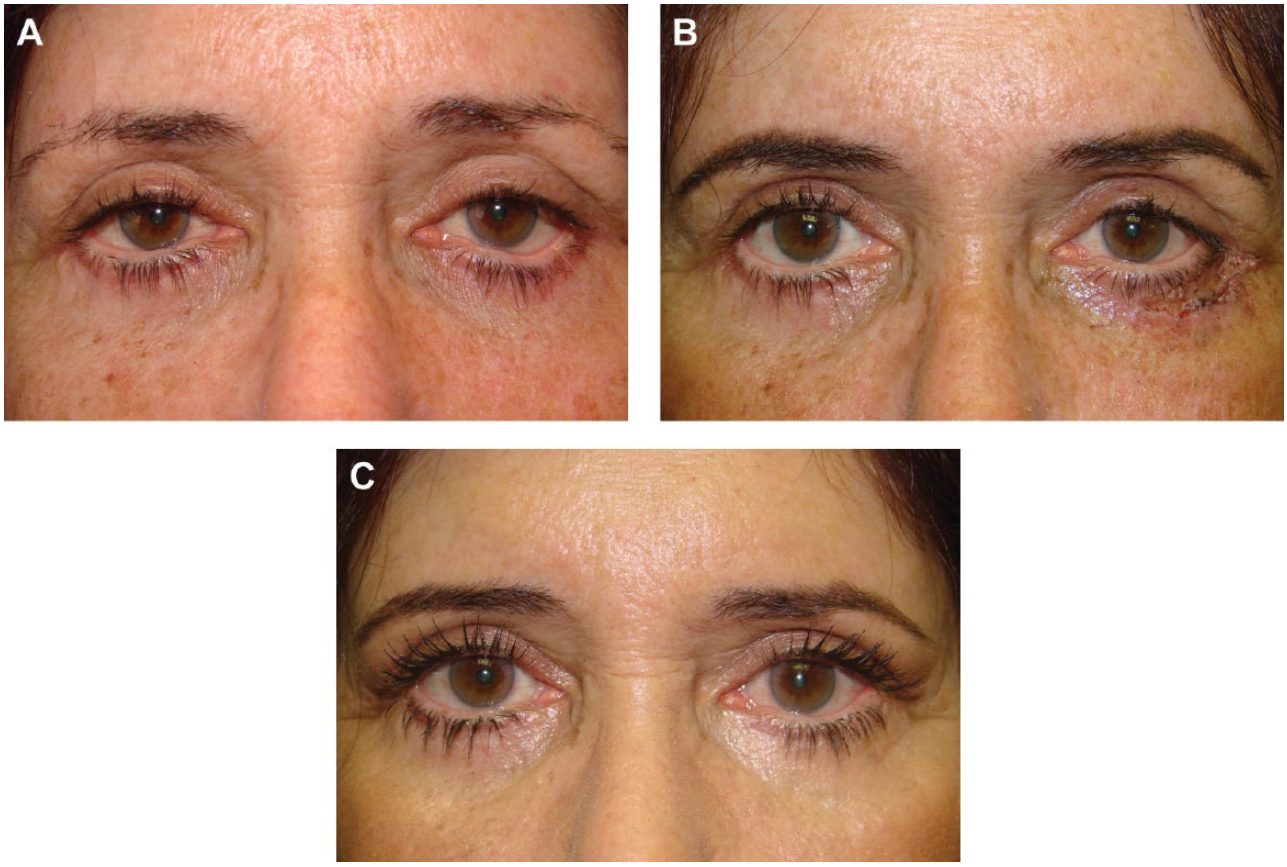

Figure 4. Eleven months after transcutaneous lower blepharoplasty, this 57-year-old woman presented with left lower eyelid retraction (A) before, (B) 2 weeks after, and (C) 9 months after skin grafting of the left lower eyelid and 4 injections of 5-fluorouracil for wound modulation.

had undergone transcutaneous surgery who do not have this problem (which is more common). Clearly, there are cases in which transcutaneous surgery is more appropriate; careful preoperative evaluation of these patients is essential to reduce the risk of PBLER.

The most commonly identified physical finding associated with PBLER in our series was orbicularis weakness (86% of eyelids). Orbicularis weakness has been shown to contribute to lower eyelid malposition after facial nerve injury or surgery (including blepharoplasty).[16] However, McCord et al[25] recently investigated whether transcutaneous blepharoplasty leads to orbicularis deficit and reported that it does not. They performed high-quality anatomic and electrophysiologic studies and found that the subciliary approach to lower blepharoplasty does not cause weakness of the orbicularis.[25] Their findings showed that a small portion of the muscle—its medial canthal segment, innervated by the buccal branch of the facial nerve—is responsible for lower eyelid tone and subsequent support. Because these nerve and muscle fibers are located inferior and medial to the transcutaneous incision and surgical dissection, they should not be disturbed during surgery. Nonetheless, our experience is that orbicularis deficit can occur (whether innervational or simply traumatic) with functional and cosmetic transcutaneous lower eyelid surgery. Our data support this observation in that all of our patients had at least 1 transcutaneous surgery and most exhibited orbicularis weakness.

We found that anterior lamellar shortage and lower eyelid laxity were present in 79% and 62% of eyelids, respectively. This was not unexpected and is consistent with previous reports.[2,11,13,14,17,21-23] What may be considered surprising is that an internal eyelid scar of significance was present in only 17% of eyelids. In part, this may have been a consequence of our measurement end point. We assessed internal eyelid scarring with the forced upward traction test (described in the Methods section). We considered this a true-positive test when there was more than mild or moderate resistance on upward lid mobility with forced displacement. We used this parameter because anterior lamellar shortage can result in a false-positive finding on upward traction testing in cases with mild or moderate resistance. We recently changed our technique for some patients with PBLER who manifest primarily anterior lamellar shortage (by this assessment technique) to involve

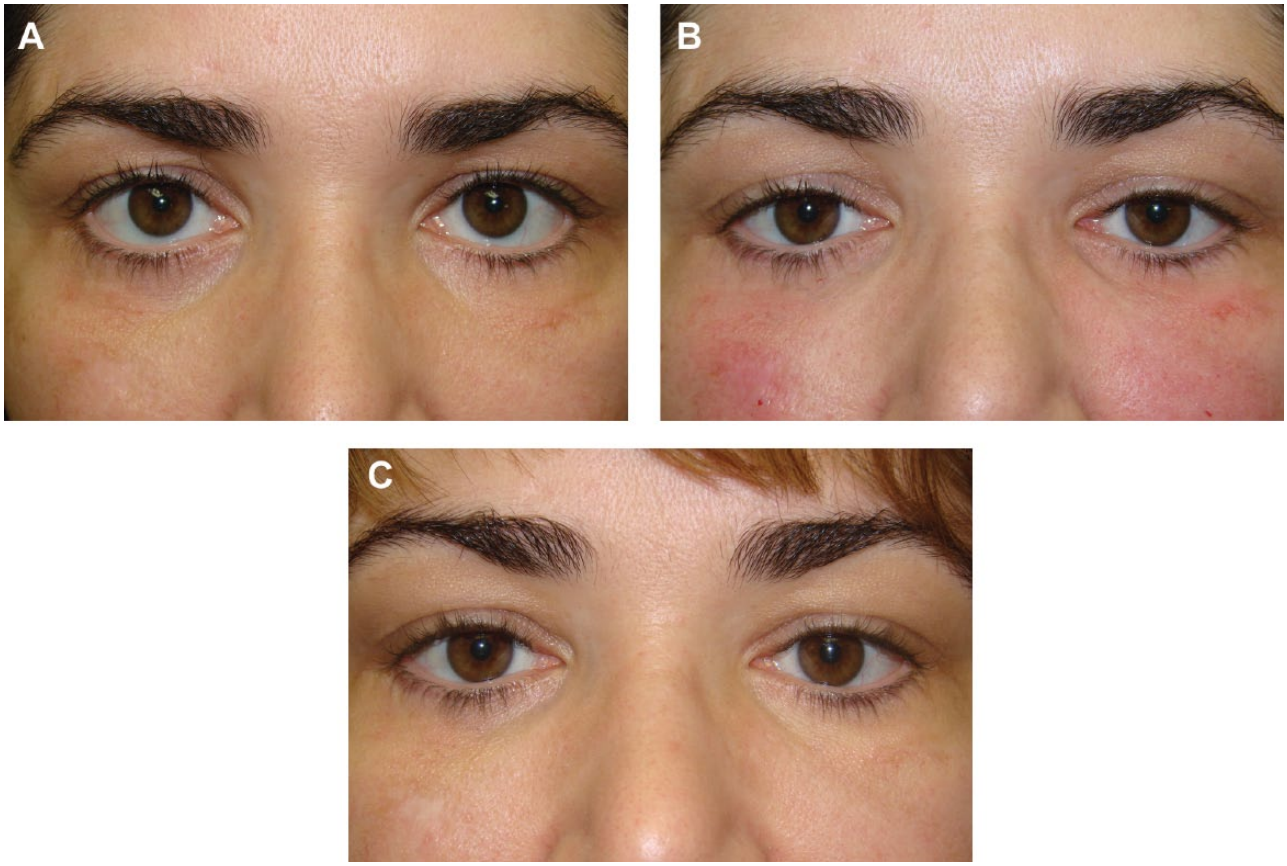

Figure 5. This 36-year-old woman presented with bilateral lower eyelid retraction 7 months after transcutaneous lower blepharoplasty (A) before, (B) immediately after, and (C) 3 months after volume-augmentation lower eyelid stenting with hyaluronic acid (Restylane; Medicis Aesthetics, Inc, Scottsdale, Arizona), which corrected the eyelid retraction.

skin grafting the lower eyelid plus aggressive treatment with postoperative fluorouracil (5-FU) injections for wound modulation in the effort to reduce scarring (Figure 4A-C).[26,27] Although 5-FU is a novel treatment in this setting, it has been shown to reduce scarring and modulate wound healing in cutaneous dermatologic procedures,[27-29] glaucoma filtration surgery,[30] and eyelid and periorbital surgery.[6,31-33] Although skin grafting is not considered an aesthetic intervention, the initial results with postoperative 5-FU (7 patients) have been impressive, with patient and surgeon satisfaction rates exceeding 90%.[26] In these cases, we have found that, after the skin flap has been raised to create the host bed for the graft, the eyelid generally moves freely upward without resistance. In 1 case where there was still some degree of resistance, and a minimally invasive transconjunctival retractor lysis was added to relax the eyelid. This suggests that the subjectively determined mild or moderate resistance identified with forced upward traction before surgery is not related to an internal eyelid cicatrix of significance. This is important because patients otherwise would have received posterior lamellar spacer grafts, which introduce a different set of potential complications and may be overutilized.

A negative-vector eyelid has been considered a risk factor for lower eyelid retraction after functional and cosmetic lower eyelid surgery but previously has not been a prominent contributor to this condition.[3,34] The negative-vector eyelid has a mechanical disadvantage because it slopes against a gradient of various degrees to maintain its normal position. Thus, any manipulation of the support structures of the lower eyelid (lateral canthal tendon, vertical skin adequacy, fat, orbicularis muscle) can alter eyelid support and shift the delicate equilibrium of eyelid position into retraction. In our series, negative-vector eyelid topography was present in 65% of eyelids. Because the study was retrospective and comprised patients who presented with eyelid retraction, the percentage of patients with preoperative negative-vector eyelids who developed eyelid malposition after the primary surgery could not be ascertained. However, the incidence of this finding in our study is high enough to suggest that this is more than coincidental. Therefore, we believe that negative-vector eyelids should be considered a red flag for any candidate for transcutaneous lower blepharoplasty.

Over the past 15 years, it has become clear that preserving or restoring volume is a critical element of appropriate

aesthetic rejuvenation of the eyelids.[35-41] Most recently, volume augmentation with fillers has emerged as a potentially effective procedure to correct lower eyelid retraction (Figure 5A-C).[42] The correction of eyelid position achieved in these cases has been attributed to both volume restoration and tissue expansion (ie, stenting or supporting the lower eyelid). In our analysis, orbital/eyelid volume depletion was identified in 70% of eyelids. As is true for negative-vector eyelid topography, the importance of this finding should not be overlooked. At the very least, more conservative fat excision or techniques directed at fat preservation should be emphasized, especially with primary transcutaneous blepharoplasty.

The observed trend toward greater eyelid retraction in patients with more anatomic/physiologic risk factors was not unexpected (Figure 3). This emphasizes the importance of identifying patients at high risk for retraction (eg, those with multiple associated risk factors) before primary surgery to reduce the likelihood of postoperative retraction. Transcutaneous blepharoplasty should be approached with caution for any patient who presents with eyelid laxity. Failure to identify this problem, or inexperience with appropriate canthal suspension techniques, is a setup for postoperative eyelid malposition—especially in the presence of negative-vector eyelid and possibly when significant fat excision is required. Surgeons should consider fat transposition or fat transfer maneuvers when appropriate. We believe that lower orbicularis strength should be assessed in every patient *before* primary transcutaneous blepharoplasty is performed. Because orbicularis deficit was nearly ubiquitous in our series, emphasizing procedures that protect the integrity of the muscle should be considered vital to postoperative success. Its presentation implies a relative or perhaps absolute contraindication to transcutaneous surgery. In these cases, alternative surgical options (eg, transconjunctival fat manipulation with skin pinch) may be more appropriate.

It is common to perform lateral orbicularis suspension as an additional eyelid support technique during blepharoplasty. Many studies have shown that orbicularis manipulation is a safe adjunct to surgery that can improve cosmetic and functional outcomes.[6,9,10,42-47] We have not independently evaluated pre- and postoperative orbicularis function in patients who have or have not undergone orbicularis suspension during surgery, but we believe that making this muscle more taught may improve its function. This warrants further investigation. Finally, when performing transcutaneous surgery, protecting the integrity of the orbicularis muscle is essential. Important goals include avoiding overzealous dissection, minimizing manipulation of the muscle, and maintaining hemostasis without aggressive cautery.

Data from this study may help us manage patients with PBLER more effectively. It is clear that traditional approaches to treatment may not address certain risk factors, such as orbicularis weakness and volume deficit. In every case, emphasis should be placed on orbicularis-sparing procedures that recess the eyelid.[16] When canthal suspension is warranted, incorporating closed-suspension techniques that also spare the orbicularis may be important.[48-50] If eyelid volume, midface soft tissue, or bony support is deficient, augmentation with synthetic filler, fat, or implants seems prudent. The overall message is to proceed cautiously and with approaches that directly address the deficits present.

This study has limitations. Its retrospective nature introduces potential errors in data collection as some details may have been less emphasized than others from patient to patient during their initial evaluations. However, the factors assessed in the study have been stressed by one of us (G.M.) for years. As such, he was meticulous in his documentation of their presence over this time period. In addition, the analysis of risk factors contributing to lower eyelid retraction is highly subjective to the extent that all physical examination findings are subjective. For example, we have no routinely available quantitative measure of lower lid volume status, degree of negative eyelid vector, "positivity" of snap back testing, and so on. Eyelid distraction testing is somewhat quantitative (as it can be measured in millimeters), but this is still quite subjective as there can be variability from examiner to examiner. The addition of orbicularis oculi needle electromyography may have improved our assessment of orbicularis strength. However, this is an uncomfortable, time-consuming, and expensive examination to require of patients, especially in the absence of premorbid electromyograph results for comparison. Because each patient's initial examination and subsequent assessments were performed by the same examiner (G.G.M.), we are confident that the data are valid. Another examiner may have noted somewhat different prevalences of the factors assessed, but the trends likely would have been similar. Finally, while we attempted to attain a detailed history (and attain medical records when we could) in each case, this was not always possible. Some patients had surgical revisions (after their initial transcutaneous surgery) for which they were unclear of the exact details, which may have affected the number of factors and the amount of lower lid retraction present. However, this information would not change the conclusions drawn from these data.

CONCLUSIONS

These findings suggest that treatment of PBLER is more complicated than originally believed. An internal eyelid scar of significance (per our criteria) was found to be relatively rare. However, less-appreciated factors, including orbicularis muscle weakness, negative-vector eyelid topography, and lower eyelid volume depletion, were prevalent. Anterior lamellar shortage and lower eyelid laxity also were common. Identifying the presence of any of these

factors before primary blepharoplasty and attempting to prevent their development during the surgery may mitigate PBLER. The presence of these factors should be considered when managing patients with PBLER. It appears that minimizing orbicularis oculi trauma and maximizing lower eyelid volumetric support are essential to achieving the best outcome and may allow a simpler, less-invasive approach to repairing the retraction.

Disclosures

The authors declared no potential conflicts of interest with respect to the research, authorship, and publication of this article.

Funding

The authors received no financial support for the research, authorship, and publication of this article.

Previous Presentation

These findings were presented in part at the annual fall meeting of the American Academy of Facial Plastic and Reconstructive Surgery (AAFPRS); October 10-21, 2013; New Orleans, Louisiana.

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