Continuing Medical Education Examination—
Facial Aesthetic Surgery

In Pursuit of Optimal Periorbital Rejuvenation: Laser Resurfacing With or Without Blepharoplasty and Brow Lift

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Learning Objectives:
The reader is presumed to have a broad understanding of plastic surgical procedures and concepts. After studying this article, the participant should be able to:

1. Recognize the 11 major signs of periorbital aging.
2. Realize the benefits of laser techniques applied to periorbital rejuvenation surgery.

Physicians may earn 1 hour of Category 1 CME credit by successfully completing the examination based on material covered in this article. The examination begins on page 333.

Although blepharoplasty and coronal foreheadplasty have been the traditional methods for improving the periorbital region, in our opinion these techniques together can address only three of the 11 major signs of periorbital aging. We found no improvement with skin-muscle flap type blepharoplasty and coronal lift in the wrinkling and pigmentation changes in the infrabrow, crow’s-foot, lower lid, and malar regions, and no improvement in malar bags, “dark circles” under the eyes, or the apparent lengthening of the vertical height of the lower lid and its associated sharp transition between cheek and lid skin. CO₂ laser resurfacing can improve these signs of periorbital aging and permits the laser transconjunctival approach if blepharoplasty is necessary, thus eliminating a visible lower lid incision. When brow ptosis is present, we prefer endoscopic brow lift to minimize dysesthesia and incision size. We evaluated 174 patients and contrasted the results of the traditional approach versus laser resurfacing with or without laser blepharoplasty and endoscopic brow lift. The mean time to evaluation was 9 months, ranging up to 2½ years. We found that the laser approach can address almost all of the 11 major signs of periorbital aging at one procedure. It is minimally invasive, technically simple and fast, offers lasting improvements, and yields high patient satisfaction and better results with fewer persistent problems than the traditional surgical approach.
Table 1. Comparing the characteristics of the aging periorbital area with those of the youthful periorbital area

![Figure 1. A, Typical appearance of the youthful periorbital area.](image1)

![Figure 1. B, Typical appearance of the aging periorbital area.](image2)

Features of youthful periorbital area
1. Brow with pleasant arch; youthful position
2. Infrabrow skin smooth
3. Crow’s-foot area smooth
4. Lower lid generally smooth
5. No redundant lid skin
6. No redundant orbital fat
7. Short apparent vertical height of lower lid (10 to 12 mm)
8. Malar area smooth
9. Gentle, indistinct transition between cheek and lid skin
10. No “dark circles” of lower lids
11. No “tear trough deformity”

Features of aging periorbital area
1. Descent of brow, especially laterally
2. Infrabrow skin crepey and wrinkled
3. Crow’s-foot wrinkles
4. Lower lid wrinkles
5. Redundant lid skin
6. Redundant or malpositioned orbital fat
7. Increased apparent vertical height of lower lid (18 to 35+ mm)
8. Malar wrinkles or bags
9. Loss of gentle transition between cheek and lid skin
10. “Dark circles” resulting from actinic pigmentation or dermal plexus seen through translucent skin
11. Occasionally, “tear trough deformity”

Blepharoplasty has been the primary traditional method for periorbital rejuvenation, but its effects are generally limited to trimming the excess skin and muscle and removing or repositioning orbital fat. Coronal foreheadplasty, and more recently, endoscopic brow lift have also been helpful in patients with ptotic brows and lateral hooding. However, these procedures have not solved the problems of crepey changes in skin texture, wrinkles, pigment spots, actinic damage, and malar bags. Traditional methods for treatment of these problems elsewhere in the face have included dermabrasion and chemical peels. Few surgeons are willing to risk dermabrasion of the eyelids. Chemical peels deep enough to give lasting tightening of the eyelid skin will cause loss of pigment and a sharp demarcation between treated and untreated regions. Overall, trichloroacetic acid peels have not been completely predictable in terms of depth, thus risking delayed healing and hypertrophic scarring with more aggressive treatments.

In contrast, laser skin resurfacing of the lower eyelids with or without blepharoplasty has been shown to be predictable and safe. It has made the use of traditional subcutaneous, skin-muscle flap type blepharoplasty almost obsolete in our practice. The only patients still requiring a subcutaneous incision are those in whom marked orbicularis hypertrophy must be reduced, or orbital fat repositioned. Clinical experience has shown that transconjunctival blepharoplasty can be performed in essentially all
patients, including those with very redundant lower lid skin, because laser resurfacing of the lower lid skin, with lateral canthal suspension when indicated, results in excellent tightening of the lower lid skin. In addition, the laser can markedly improve the crepey or wrinkled appearance of lower eyelid skin and effectively treat malar bags.

There are other important signs of aging in the lower periorbital area that are not improved by any of the above traditional procedures (Figure 1 and Table 1). These include the following:

A. An apparent increase in the vertical height of the lower lid from 10 to 12 mm seen typically in the 20- to 30-year range, to 18 to 35+ mm

B. Loss of the gentle, indistinct transition from cheek skin to eyelid skin seen in youth

C. Mild hyperpigmentation of the elongated lower lid skin, contributing to the appearance of “dark circles under the eyes”

The arcus marginalis release with orbital fat repositioning described by Dr. Sam Hamra and the transpalpebral cheek lift described by Dr. Rod Hester address some of these more subtle signs of aging, but their complexity and morbidity have limited the adoption of these techniques by many plastic surgeons. In comparison, laser resurfacing is a much simpler and faster technique and can yield significant improvement in all three of these signs of aging in the lower periorbital area.

Aging in the upper periorbital area is manifested not only by redundant skin, fat, and lateral hooding, but also by crepiness or actual wrinkling of the infraorbital skin and of the crow's-foot area. The optimal method of rejuvenation of the periorbital area should deal with all of these problems during one procedure. However, the crepiness and wrinkling cannot be treated by chemical peel at the time of blepharoplasty for two reasons: First, the lack of predictability of subsequent skin contraction makes it impossible to judge the amount of skin resection needed; and second, there is potential for interference with the healing of the incision. When there is crepiness or wrinkling of the infraorbrow skin, laser resurfacing is carried out just before the upper blepharoplasty. The amount of skin tightening is apparent immediately, so the amount of skin to resect by upper blepharoplasty can be accurately judged by the usual methods. Only laser resurfacing with blepharoplasty (and endobrow lift when necessary) can safely and predictably address most of the signs of upper and lower periorbital aging in one operation. In fact, laser resurfacing can safely be combined with almost all other facial aesthetic surgical procedures. The longevity of improvement in the crow's-foot wrinkles depends on the degree to which the patient contracts the orbicularis oculi muscle in response to sun and expression, in addition to the genetic quality of the skin and past and future actinic damage.

Brow lift also has an important role in treating the loose skin that contributes to the crow's-foot wrinkles and lateral hooding. In this study, coronal brow lift was frequently combined with traditional blepharoplasty, and endoscopic brow lift was frequently combined with laser resurfacing with or without laser transconjunctival bleph-
Patients Obtaining “Excellent” Results
(≥95% Wrinkle Reduction)

Figure 2

Blepharoplasty, as indicated by the patient’s needs. Our purpose was to compare these newer methods with traditional procedures to determine the optimal method of periorbital rejuvenation.

Patients and Methods

A total of 174 patients were evaluated for this study. A retrospective review was performed of all patients who underwent periorbital laser resurfacing from 1994 through 1996 by meticulous examination of 12 to 20 photographs for each patient and by interview and examination whenever possible. In the laser resurfacing group (n = 101), to allow time for the initial tightening of the skin to relax, only those patients with follow-up greater than or equal to 5 months were included in the study. The laser group included 12 men and 89 women, ranging in age from 34 to 78 years, mean age 57 years (Table 2). Eighty-eight patients underwent upper lid laser resurfacing, 98 underwent lower lid laser resurfacing, and 36 underwent total facial laser resurfacing. Sixty patients underwent upper lid laser blepharoplasty, and 72 patients underwent lower transconjunctival blepharoplasty.

Concurrent procedures for these patients (Table 3) included 42 lateral canthal suspensions, 62 endoscopic brow lifts, and 53 face lifts. The patients undergoing laser resurfacing were divided into two groups: those with simultaneous laser blepharoplasty and those without.

Seventy-three patients who underwent “traditional blepharoplasty,” that is, standard upper lid blepharoplasty (skin, muscle, and fat resection) along with subciliary lower lid blepharoplasty (via skin-muscle flap, including fat removal) were also evaluated. The mean age, age range, and female-to-male ratio of this group were similar to the laser group (Table 2). Patients undergoing traditional blepharoplasty were excluded if follow-up was less than 2 months (without laser resurfacing the final result can be determined earlier).

For each patient, preoperative photographs were used to determine the degree of severity of wrinkling for each of the following periorbital regions: infrabrow, crow’s-foot, malar, and lower lid. The following numerical values were assigned for each of these four periorbital regions according to severity of wrinkling: 0 = none, 1 = mild, 2 = moderate, 3 = severe. Thus the “wrinkling severity rating” is the sum of these four numbers and would range from 0 to 12. The purpose of this rating was to determine the patient’s severity of wrinkles to better compare the different groups and to ensure their baseline similarity (Table 2). A separate “wrinkle reduction scale” was used to assess the degree of improvement. This scale has been described previously² to assess results of facial laser resurfacing. In this system, “excellent” denotes 95% or greater reduction of wrinkles, “very good” denotes a 75% to 94% reduction, “fair” denotes a 50% to 74%
Figure 3. A, Preoperative view of a 63-year-old woman with signs of periorbital aging. B, “Excellent” postoperative results at 5 months after traditional blepharoplasty.

Figure 4. A and C, Preoperative views of a 58-year-old woman with signs of periorbital aging. B and D, More typical postoperative results at 3½ months after traditional blepharoplasty. Many signs of aging remain, in spite of concurrent brow lift: extensive infrabrow, crow’s-foot, lower lid, and malar wrinkles; and slight pigmentation of lower lid. Note in Figure 4D persistent long (approximately 20 mm) apparent vertical height of the lower lid and sharp transition between cheek and lid skin.
Patients Obtaining ≥75% Wrinkle Reduction

![Graph showing wrinkle reduction percentages for Traditional Blepharoplasty (n=73), Laser Only (n=24), and Laser + Blepharoplasty (n=77).]

reduction, and “poor” denotes a less-than-50% reduction. To determine the outcome not only in terms of wrinkle reduction, but to evaluate as many parameters of peri orbital rejuvenation as possible, a “comprehensive eyelid rating” was performed as shown in Table 4. All assessments of results were made by the junior author, who was not involved in the surgery or the aftercare, with every effort made to be as objective as possible.

In addition, interviews were conducted in which patients undergoing peri orbital laser resurfacing (n = 38) were given a questionnaire and were examined by the junior author. All patients undergoing laser resurfacing were invited for interviews, but the rest were either unavailable to return for the interview or had too far a distance to travel. The questionnaire focused on patient satisfaction and patient perception of any complication related to laser resurfacing.

Surgical Techniques

Details of the technique for laser resurfacing were similar to that reported previously. The laser used was the Ultrapulse 5000C® (Coherent, Inc., Palo Alto, CA). During the first half of the series, the 3 mm handpiece was used at 500 mJ and 2 to 4 watts. When it became available, the computerized pattern generator scanner was used at a similar fluence of 300 mJ through its 2½ mm spot, and density of 5 to 7. Most patients had one pass at these settings and a second pass at half the mJ (“1½ passes”) for the eyelids proper. Only in cases of extreme redundancy or thickness of skin were two full passes made. Crow’s-feet and malar bags are thicker skin and were treated with two to three full passes (rarely four). If the upper peri orbital area is to be resurfaced concurrently with upper blepharoplasty, the resurfacing is done first so skin resection can be judged accurately. In all other combined cases, resurfacing is done at the end of the operation.

Table 4. Comprehensive eyelid rating scale

<table>
<thead>
<tr>
<th>Class</th>
<th>Eyelid evaluation</th>
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<tbody>
<tr>
<td>I, Optimal</td>
<td>Smooth lid, no lowering of lid margin, no visible muscle hypertrophy, scar not visible</td>
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<tr>
<td>II, Good</td>
<td>Minor imperfection or variation from Class I</td>
</tr>
<tr>
<td>III, Less than satisfactory</td>
<td>A. Lid not smooth: Fat bulges, muscle hypertrophy, persistent wrinkles</td>
</tr>
<tr>
<td></td>
<td>B. Lowering of lid margin: Scleral show or lateral drooping or rounding</td>
</tr>
<tr>
<td></td>
<td>C. Visible scar or undesirable pigmentation change</td>
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<tr>
<td></td>
<td>D. Major complication: Lagophthalmos, persistent ectropion, exposure keratitis, other</td>
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Patients Obtaining Class I ("Optimal") Comprehensive Eyelid Rating

Smooth lids, no lowering of lid margin, no visible muscle hypertrophy, no noticeable scar, no unfavorable pigmentation changes

Figure 6

Our method of endoscopic brow lift is reported elsewhere. Briefly, three to five radially oriented incisions are made within the frontal hairline. Dissection is subperiosteal centrally and between the superficial and deep layers of the temporal fascia laterally. The periosteum is incised completely across the superior orbital rims. The corrugator muscles are resected and the procerus transected. Screw fixation through the paramedian incisions is maintained for 10 days.

Lower transconjunctival and upper transcutaneous blepharoplasty is performed with the 0.2 mm focused cutting handpiece on the same laser. We have previously described our technique in the literature and by video. The transconjunctival incision and dissection are performed at 8 watts in the continuous wave mode. Because of the remarkable skin tightening accomplished by laser resurfacing, no lower lid skin resection has been necessary since we began performing laser resurfacing 4 years ago.

Figure 7. A, Preoperative view of a 61-year-old man (representative case) precluded from blepharoplasty because of anticoagulation. B, Postoperative view, 2½ years after laser resurfacing only. Note smoothness of lids, elimination of mild hyperpigmentation of lower lids, and reestablishment of gentle, indistinct transition from cheek skin to lid skin, in spite of not undergoing blepharoplasty or lid tightening.
Figure 8. A and C, Preoperative views of a 54-year-old woman (representative case) with signs of periorbital aging. B and D, Postoperative views, 1½ years after laser blepharoplasty, laser resurfacing, and endobrow lift. Note the lasting restoration of youthful brow arch and position; loss of wrinkles of rhytids, brow, crow’s-foot, and lower lid areas; shorter apparent vertical height of lower lid; and reestablishment of gentle, indistinct transition between cheek and lower lid skin.

Figure 10. A, Preoperative view of a 72-year-old woman with severe malar bags. B, Postoperative view at almost 3 years after laser transconjunctival blepharoplasty with no skin resection, malar bags treated with laser resurfacing; also face lift, lateral canthal suspension, and endobrow lift. Note the disappearance of malar bags, marked decrease in apparent vertical height of lower lid, reduction of mild hyperpigmentation of lower lid skin, and resulting indistinct transition between cheek skin and lower lid skin. Reprinted with permission from Roberts TR III, The Emerging Role of Laser Resurfacing in Combination with Traditional Aesthetic Facial Plastic Surgery. Aesthetic Plast Surg 1998;22:75-80. Courtesy of Springer-Verlag, New York, NY.

Figure 11. A, Preoperative view of a 73-year-old woman with signs of periorbital aging. B, Postoperative view at 2 years after endoscopic brow lift and laser resurfacing only (no blepharoplasty). Note the persistent improvement in wrinkles of infrabrow, crow’s-foot, and lower lid, and the decrease in visibility of previous subciliary blepharoplasty scar.

ago. The upper lid skin incision is made at 15 mJ and 4 W in the pulsed mode to avoid thermal damage to the skin. The rest of the upper lid dissection is at 8 W continuous wave.

Preoperative assessment of lower lid margin laxity is crucial to obtain optimal results. Laxity is evaluated by pulling firmly downward on the lower lid for 5 to 10 seconds, being certain that the orbicularis, levator, and frontalis muscles are relaxed. The lid is gently released, and the time for the lid margin to recontact the globe is measured. Five or more seconds mandates tightening of the lateral canthus to avoid scleral show or ectropion. The method we prefer is lateral canthal tendon resuspension through the upper blepharoplasty incision.10-12

After surgery, all lasered areas were covered with a semi-permeable membrane (Silon TSR®, Bio-Med Sciences, Bethlehem, PA) or Aquaphor® ointment (Beiersdorf, Inc., Norwalk, CT) for 4 to 6 days, then Aquaphor® ointment
Persistent Periorbital Problems: Class III Patients

![Bar Chart](https://academic.oup.com/asj/article-abstract/18/5/321/191210)

**Figure 12**

and soaks four times daily until the eighth day. On the eighth day, no further ointment is applied, but the soaks are continued until all crusts are gone.

**Results**

For each of the procedure groups studied, the percentage of patients obtaining the highest level of results ("excellent," ≥95% wrinkle reduction) is shown in Figure 2. Although this quality of result can be obtained with traditional blepharoplasty (Figure 3), it was surprising to find that this occurred only 5% of the time. More typical in our experience with traditional blepharoplasty are the results shown in Figure 4. Although redundant skin, muscle, and fat have been removed, extensive signs of aging remain. Traditional blepharoplasty cannot be expected to do more. Almost six times as many patients who had only laser resurfacing as those who had traditional blepharoplasty achieved ≥95% wrinkle reduction (Figure 2).

With the combination of laser blepharoplasty and laser resurfacing, almost 10 times as many patients obtained excellent results as with traditional blepharoplasty.

If the standards are lowered and we look at patients obtaining ≥75% wrinkle reduction (Figure 5), we still see far more patients obtaining this result in both laser groups than with traditional blepharoplasty (83% and 85%, compared with 32% for traditional blepharoplasty).

We broadened the evaluation by performing "comprehensive eyelid ratings" (Table 4) to include not only smoothness of the lid but also visible orbicularis hypertrophy, distortion of the lid position, scarring, and permanent unfavorable pigmentation changes. Figure 6 shows the percentage of each group achieving the highest comprehensive eyelid rating, class I. Once again, far more patients in the two laser groups had optimal results (71% in both) compared with traditional blepharoplasty (40%). Representative cases of laser resurfacing with and without laser blepharoplasty and endobrow lift are shown in Figures 7 to 11. The durability of these results is suggested in Figures 7, 8, 10, and 11.

The incidence of persistent periorbital problems is shown in the comprehensive rating group III (Figure 12). Roughly three times as many traditional patients had lid irregularities (muscle or fat bulges, excessive wrinkles) and lid malposition as did patients in the two laser groups. There were no other major complications related to the laser treatments. Specifically, there were no bacterial or viral infections, no delayed healing, no contact dermatitis, and no scaring (although three early patients developed a tiny area of induration in the upper lid, which resolved with a single steroid injection). The other laser problems were minor and temporary and included erythema (58%), milia (45%), pruritus (16%), transient hyperpigmentation (8%).
and synechia (3%). The incidence of major and minor complications is similar to what has been previously reported. Mild hypopigmentation without demarcation lines was observed in 39% and was interpreted very positively by patients as loss of the “dark circles” under their eyes. Patient satisfaction in the laser groups was judged by asking whether the patient’s goals had been met and whether they would recommend the procedure to a friend (Figure 13).

Discussion

To obtain optimal rejuvenation, it is necessary to reverse as many as possible of the characteristics of the aging periorbital area (Table 1 and Figure 1, B) to those features characteristic of youth (Table 1 and Figure 1, A). Traditional blepharoplasty with or without brow lift can only address two or three of the 11 characteristics of aging (redundant skin and fat and brow position). The results we have shown with laser resurfacing, with or without laser transconjunctival blepharoplasty and brow lift when appropriate, dramatically improve almost all of these 11 characteristics of aging in a single operation (Figure 8).

Because lid tightening was performed far more frequently in the laser groups (21% in laser only and 48% in laser plus blepharoplasty) than in the traditional group (5%), we believed it was important to be certain that this higher frequency of lid tightening was not the reason that the laser groups had so much better results than the traditional blepharoplasty. Figure 14 shows the effect of lid tightening (lateral canthal suspension) on all patients with laser resurfacing (laser alone and laser plus blepharoplasty). The results in patients with lid tightening actually were slightly worse in terms of wrinkle reduction and the comprehensive eyelid evaluation, probably because those lids requiring tightening were generally in worse condition than those that did not require tightening. Thus the higher incidence of lid tightening in the laser groups cannot be the reason for the superior results in the laser groups compared with the traditional group. The other variable that could favorably influence the results is concomitant brow lift by reducing lateral hooding and upper crow’s-foot wrinkling. However, a slightly higher percentage of traditional patients underwent brow lift (50/73 = 68%) than did the patients undergoing laser resurfacing (62/101 = 62% had brow lift); therefore the beneficial effects of brow lift cannot explain why the laser groups had better results. Thus it seems clear that the better results in the laser groups can only be due to the favorable effect of laser resurfacing.

Malar Bags and Wrinkles

We believe that the correction of malar bags and wrinkles with laser resurfacing is so striking (Figure 10) and durable that it merits special comment. We know of no
other method that offers this quality of improvement and certainly no method that is simpler. Note that no skin was excised in any of these cases.

**Conclusion**

This concept of laser resurfacing, combined when appropriate with laser transconjunctival blepharoplasty and endoscopic brow lift, seems to be the closest we can presently approach to optimal rejuvenation of the periorbital area because it addresses at one procedure almost all 11 of the signs of periorbital aging, not just excess skin and fat; is minimally invasive; is technically simple and fast; can be done concurrently with other facial aesthetic surgery; offers superior results for malar bags; seems to have lasting results; yields high patient satisfaction; and, compared with traditional blepharoplasty, offers better results and fewer persistent problems.

**References**