Cosmetic Eyelid and Facial Surgery

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Abstract. The goal of cosmetic surgery is to reverse anatomical changes that occur in the face with aging. It is a rapidly growing subdiscipline of ophthalmic plastic surgery and includes forehead, eyelid, mid-face, lower face, and neck surgery, most performed by ophthalmic plastic surgeons. The current article reviews updates in cosmetic eyelid and facial surgery, including minimally invasive techniques such as cable suspensions, injections, and fillers. (Surv Ophthalmol 53:426–442, 2008. © 2008 Elsevier Inc. All rights reserved.)

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Ophthalmic plastic surgery has traditionally been divided into four sub-disciplines: eyelid, lacrimal, orbit, and cosmetic. Twenty years ago the average specialist focused on the first three disciplines with few surgeons having any interest in cosmetic surgery and even fewer with an emphasis on cosmetic surgery. This trend has reversed in the last decade. Today most specialists perform some cosmetic surgeries and many emphasize this area of their practice. A good metric of the growth of the subdiscipline of cosmetic surgery is the annual two-day national meeting of the American Society of Ophthalmic Plastic and Reconstructive Surgery, which devotes half of the meeting to cosmetic surgery. This trend has reversed in the last decade. Today most specialists perform some cosmetic surgeries and many emphasize this area of their practice. A good metric of the growth of the subdiscipline of cosmetic surgery is the annual two-day national meeting of the American Society of Ophthalmic Plastic and Reconstructive Surgery, which devotes half of the meeting to cosmetic surgery. Cosmetic surgery is no doubt the most rapidly changing subdiscipline of ophthalmic plastic surgery. The recent trend toward greater interest in this subdiscipline has generated much recent advancement. It is exciting to see the ophthalmologist bring the traditions of precision and finesse that characterize ocular microsurgery to the field of cosmetic facial surgery. This review should serve as an update of recent major changes in the field.

Upper Face

UPPER LID BLEPHAROPLASTY

The eyes are an important component of facial aesthetics. Cosmetic surgery of the eyelids can have a dramatic effect on facial harmony and the perception of aging. Upper and lower blepharoplasties are commonly performed together. Occasionally other facial and skin rejuvenation procedures such as brow/midface lift and laser or chemical skin resurfacing are also performed at the same time.
Upper eyelid blepharoplasty (Fig. 1) is one of the most common cosmetic procedures performed by general and ophthalmic plastic surgeons. Both men and women complain about tired-looking eyes, excess skin, droopy eyelids, or circles around the eyes. Several distinct anatomic features may contribute to patients’ perception of the need for upper eyelid blepharoplasty. Excess and laxity of upper eyelid skin can cause superior visual field defects that are usually temporal rather than nasal, reflecting the tendency of the eyelid skin to be more extensive temporally. This may even confound diagnostic automated field testing in patients with glaucoma or ocular hypertension.

PREOPERATIVE EVALUATION

Preoperative evaluation includes a thorough and complete eye and facial clinical examination. The patient must undergo a complete medical work-up, with the emphasis on ocular surface disease and dry eyes, as well as establishment of rapport and realistic patient expectations. Patients should discontinue use of acetylsalicylic acid and other anticoagulants such as plavix, nonsteroidal anti-inflammatory drugs (NSAIDs), vitamin E, and herbals two weeks before surgery. Coumadin should be stopped after general practitioner/cardiologist approval. Smokers should also be advised to stop smoking two weeks before the procedure, as smoking can delay wound healing. The relationship of concomitant eyelid and eyebrow malposition should be evaluated and documented. Evaluation of pre-septal and eyebrow fat pads is important in redefining the superior sulcus. In recent years there has been an increasingly popular belief that fullness of the eyelids is a sign of youth; this has led most cosmetic surgeons to preserve as much pre-septal fat as possible. Standard pre- and postoperative photography, on a blue background with diffused overhead lighting, are of utmost importance in aesthetic surgery and can provide a useful method of evaluating improvement and anatomical changes in the eyelid position in relation to the globe, orbit, and eyebrow.

Standard preoperative and postoperative photographs are as important to cosmetic surgery as pre- and postoperative visual acuities are to cataract surgery. Photographs should be taken without flash in order to see wrinkles and bags.

SURGICAL TECHNIQUE

Surgery is designed primarily to enhance aesthetic appearance and improve visual field deficits. Improvement in visual field is a function of excision of redundant eyelid tissue and is most dramatic in patients with a margin reflex distance equal to or smaller than 3.5 mm.

Knowledge of the eyelid anatomy is an absolute prerequisite for performing blepharoplasty. There are two fat compartments in the upper eyelid: a pale yellow medial compartment, which derives from the adipose body of the orbit; and a deep yellow lateral compartment, derived from the preaponeurotic fat. Accessory or ectopic fat compartments have also been described in 20% of cases and may represent an extension of the lateral preaponeurotic fat pad. The superolateral aspect of the adipose part of the orbit does not reach the upper eyelid and therefore is not resected in blepharoplasty. The superomedial part, which is located between the superior oblique and medial rectus muscles and reaches the orbital septum, represents the medial compartment of the upper eyelid and is usually removed in upper blepharoplasty when fat sculpturing is performed. The preaponeurotic fat pad is located under the orbital roof and lies on the aponeurosis of the levator palpebrae muscle, in contact with the orbital septum. Laterally it extends behind the lacrimal gland, and medially a fibrous structure containing the reflected tendon of the superior oblique muscle separates it from the nasal fat pad. This preaponeurotic fat is the
lateral fat compartment that is resected in upper blepharoplasty.

Skin margins are outlined with the patient in sitting position, these marks should be checked with the patient lying supine. The lower margin of the incision is made along the eyelid crease, beginning medially above and lateral to the medial canthus. Care must be taken not to include the naso-orbital depression, as this can cause webbing. Laterally, the line is extended to the sulcus between the orbital rim and the eyelid, and may be directed slightly upward. It is important to lift the eyebrow manually, elevating the excess of skin. The amount of skin to be excised is checked with toothed forceps to ensure that overcorrection of the skin is avoided. In our experience, it is important to leave 22–24 mm of anterior lamella to prevent postoperative shortening and lagophthalmos. These numbers should be adjusted upward for proptotic patients, patients with deep superior sulcus, and for the novice surgeon.

Usually, a crescent-shaped incision is made in the upper eyelid. However, in advanced age lateral hooding with greater excess of eyelid skin laterally is commonly seen, so it might be preferable to use a scalpel-shaped incision that is widest laterally and tapers medially. That incision can provide indirect upward support of the lateral eyebrow.

The eyelid is then injected with 1% lidocaine with 1:100,000 epinephrine. The initial skin incision is usually made with a sharp no. 15 scalpel, monopolar cauterity, radiofrequency (Ellman) or laser. Before the skin muscle flap is excised with sharp scissors, laser, or Colorado needle-tip electrocautery (Colorado Biomedical, Evergreen, CO), bleeding vessels should be cauterized; this can be done by electrocautery or by defocusing the laser 6–8 inches (15–20 cm) away from the tissue.

A survey conducted among plastic surgeons determined that 70–90% of all surgeons use laser as the only tool for cutting and hemostasis in blepharoplasty, and that carbon dioxide (CO2) lasers are the most common. The laser has a hemostatic effect of up to 0.1 mm on blood vessels, creating a nearly blood-free surgical site while the skin and orbicularis are being dissected and the retro-septal fat is being excised. Advantages of CO2 laser blepharoplasty are reduced bleeding; shorter intraoperative time and postoperative recovery period; improved anatomic dissection; and less pain, edema, bruising, and scaring. It is imperative to protect the patient by using stainless steel corneal shields when performing laser blepharoplasty because of the risk of globe perforation. Many general plastic surgeons in public academic centers, however, do not use laser and would rather use sharp blade or radiosurgery (Ellman unit).

After skin and orbicularis removal, if fat sculpting is desired, the orbital septum is gradually opened, using sharp and blunt dissection, thermal cautery, or laser. One or more passes of the laser are made through the septum, permitting orbital fat to bulge. Fat is resected to the desired amount. Of the medial and central fat, only fat that comes easily into the wound is excised. It is important not to actively pull fat from the orbit. Medially the fat is whiter than in the central compartment and its anatomic position may vary. Because blood vessels present in the medial fat compartment are larger, they cannot be coagulated with the CO2 laser and must be cauterized. Gentle pressure on the globe causes herniation of the medial fat compartment and may help in identification. If lower eyelid blepharoplasty is planned, the skin incision is left unsutured until lower blepharoplasty is completed. This is especially important in cases where incision in the upper eyelid crease is planned for lateral canthopexy.

The skin incision can be closed using running or interrupted sutures with various absorbable or permanent materials, with no apparent effects on aesthetic outcome. The use of tissue-adhesive cyanocrylate glue in skin closure has also been reported.

The sub-brow fat pad can be repositioned during wound closure with use of eyelid suspension sutures. This can be done with 2–3 absorbable sutures that incorporate the orbicularis from the lower and upper sides of the incision along with the superolateral arcus marginalis. Placing of the sutures in this way might result in early over-correction of the upper eyelid, which, however, softens within days after the surgery.

The transconjunctival approach to upper eyelid blepharoplasty is of limited usefulness in primary or secondary cases with pseudo-herniation of the medial fat pad.

**POSTOPERATIVE CARE**

Postoperatively, patients should be advised to use ice packs on the surgical site for 3 days to minimize postoperative swelling, and erythromycin ophthalmic ointment on the incision sites for 2 weeks. Non-absorbable sutures, if used, can be removed 7–10 days after the procedure.

**COMPLICATIONS**

The most common complication of cosmetic surgery is failure to meet the patient’s expectations. This can be avoided by preoperative counseling of what reasonably can be achieved with surgery. In such a way patients with unreasonable expectations...
can be identified. From a medico-legal standpoint, it is probably best for the surgeon to define *reasonable expectations* as a statement that is read and signed by the patient.66

Possible complications include upper eyelid retraction with scleral show from anterior lamellar inadequacy, lagophthalmos, and corneal exposure. Patients might present with various degrees of scleral show, tearing, ocular discomfort, and dry eyes. Acquired strabismus accompanied by persistent diplopia can occur, and superior oblique palsy and acquired Brown syndrome have been described.123,133 Blurred vision from induced corneal astigmatism usually lasts for up to 3 months after surgery, and subjective visual disturbances might last for 1 year.116

**ENDOSCOPIC BROW LIFT**

The endoscopic approach to forehead and midface lift has become a popular method of facial rejuvenation, requiring minimal incision (Figs. 2 and 3).13,20,22,60 The use of endoscopy has led to improved aesthetics with respect to postoperative scarring, as well as to decreased healing time and greater patient satisfaction. In the past, most browlifts involved bicoronal dissection with a large incision;108 the endoscopic browlift is less invasive, better tolerated, and less prone to intra- and postoperative complications.70 The goal of forehead rejuvenation is to elevate the brows and midface, depending on the extent of dissection, and to address glabellar frown lines by weakening the corrugator and procerus muscles. It is best suited for brows with mild to moderate ptosis of up to 1.5 cm.70,108,134

A thorough understanding of the temporal anatomy, location of the retaining ligaments of the cheek, and relationship of the facial nerve to the temporal planes is of utmost importance in order to achieve aesthetic improvement and prevent complications.

In younger patients it allows repositioning of the orbital portion of the orbicularis oculi muscle; in midface rejuvenation it lifts the malar pads, allowing a smooth transition onto the upper face that blends nicely into the lower face. In older patients endoscopic brow lift serves as a useful adjunct to eyelid and midface surgery. It corrects orbital festoons and lower eyelid bags and smoothens the upper third of the nasolabial fold.12

**SURGICAL TECHNIQUE**

Preoperative marking is done with the patient in an upright position for placement of temporal and paramedian incisions, the desired brow elevation (5–8 mm medially and 8–10 mm laterally), and the anticipated course of the temporal branch of the facial nerve.108

The surgery can be performed under intravenous sedation or general anesthesia. Lidocaine 1% and epinephrine 1:100,000 are locally injected at the incision sites and to block the supraorbital and supratrochlear neurovascular bundles. The forehead and upper midface are injected with 0.01% lidocaine and 1:10,000,000,000 epinephrine solution (tumescent solution) to facilitate dissection and reduce bleeding. Incisions are made behind the hairline and include one central or paracentral and two temporal incisions, which are placed on a line connecting the ala nasi and the lateral canthus. Some surgeons make two additional paracentral incisions. Incisions are made to the depth of the pericranium centrally and to the depth of the deep temporalis fascia laterally. The central pocket is dissected in the sub-galeal or subperiosteal plane using a curved semi-sharp dissector. The lateral pockets are dissected toward the central pocket, while taking care to detach the conjoint fascia. Endoscope-assisted dissection is done from 1 cm above the orbital margin while working towards the...

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*Fig. 2. A 55-year-old man, before (left) 2 months after (right) forehead lift (endoscopic brow lift), and four-eyelid blepharoplasty. Note marked improvement in eyebrow position, forehead rhytids, and lower eyelid bags.*
supraorbital and supratrochlear neuromuscular bundles. It is important to lyse periosteal attachments at the superior and lateral orbital rims until the sub-brow fat pad is visualized. If midface lift is desired, dissection is extended to the zygomatic arch and the lateral canthus. Medially, the corrugator muscles located adjacent to the neurovascular bundles can be lysed or sharply dissected. The procerus muscle can be dissected in a similar fashion. Prior to fixation the amount of dissection, residual adhesions, and desired lift are examined by a finger test (passing index finger in the superior orbital margin to evaluate residual adhesions that hold the eyebrow and may prevent it from adequate elevation postoperatively).

There are several methods of suture fixation. The temporal pockets are fixated to the deep temporalis fascia. It is important to grasp a robust part of the superficial temporalis fascia distally and adjust the tension to the desired amount by fixating it to the deep fascia precisely at the location needed, usually in a mattress suture.

Centrally, the forehead can be sutured to absorbable or titanium screws that are drilled in the frontal bone, or to a cortical tunnel on the outer table of the calvarium. Some surgeons use 2/0 monofilament nylon sutures to secure the forehead to the subgaleal tissue posteriorly. These can create bolsters, which disappear when the sutures are removed 2 weeks postoperatively. Additional fixation techniques include the use of fibrin glue, K-wire fixation, and temporary titanium screws. Skin incisions are sutured using absorbable sutures or surgical staples. Some surgeons advocate the use of dressing and elastic band for 1 week; sutures or staplers are removed 14 days postoperatively.

A described limitation of endoscopic browlift is the inability to predict the long-term results of forehead elevation. Minimally invasive brow suspension has been described using subcutaneous suspension sutures with no open dissection, but its long-term outcome in comparison to endoscopic brow lift is not known.

COMPLICATIONS

Possible complications, which may vary with different dissection planes, include frontal branch weakness, temporary numbness, hematoma, seroma, incisional alopecia, temporal fat atrophy, wound dehiscence, suture abscess, unbalanced eyebrows, and in cases of lower blepharoplasty incision endoscopic midface lift lower eyelid retraction with lagophthalmos. Leakage of cerebrospinal fluid after endoscopic browlift was reported in a patient with a previous history of head trauma.

Lower Face

LOWER EYELID BLEPHAROPLASTY

Aging in the lower eyelid can cause a number of aesthetic changes, including skin laxity or excess, orbital septum laxity, orbicularis laxity or hypertrophy, herniation of the orbital fat, canthal laxity, malar festoons, crow’s feet, and periocular wrinkles. Common complaints include eyelid bags, circles under the eye, wrinkles around the eye, or a tired look. In the past a simplified approach was taken for patients seeking surgical treatment for eyelid bags. Only patients whose problem was amenable to removal of skin and fat were considered suitable candidates for classic blepharoplasty. Anatomically, relaxation of the orbital septum, orbicularis muscle, and skin can cause protrusion and shifting of intraorbital fat and eyelid bags. The traditional procedure in lower eyelid blepharoplasty was to remove the pseudo-herniated fat via skin incision. A recent, more conservative approach includes repositioning of the herniated fat into the subperiosteal space. Both of these approaches may be accompanied by strengthening procedures for the attenuated septum or septrhaphy and tightening of the orbicularis muscle and skin. Defocused CO₂ laser irradiation of the undersurface of the orbicularis results in persistent shortening and tightening of the muscle tissue.
Most cosmetic surgeons today have developed a customized approach to eyelid surgery in which the specific anatomic problems are identified and the operation is individualized to address these problems. Additional anatomic changes that contribute to eyelid bags include pseudoherniation of fat pads, damaged skin, orbicularis muscle hypertrophy, eyelid fluid, tear trough deformity, and triangular malar mound.

SURGICAL TECHNIQUE

In cases of fat removal or repositioning or pseudoherniation of orbital fat, enhancement of the deficient suborbital portion of the malar complex is the principal component of modern lower eyelid blepharoplasty. Skin removal is usually unnecessary because there is typically inelasticity rather than actual excess of skin. The widely preferred approach is transconjunctival incision, which results in less eyelid retraction, less scleral show, and less postoperative ectropion than other methods. Some surgeons prefer a transcconjunctival approach in patients who have hypertrophy of the orbicularis oculi muscle and therefore require muscle excision. The inferior fornix, eyelid skin, and lateral canthus are anesthetized with 1% lidocaine containing 1:100,000 epinephrine. The lower eyelid is retracted with a lacrimal or Desmarre retractor. A tarsoconjunctival incision is made 4–6 mm below the lid margin through the conjunctiva and lower eyelid retractors; this can be done using sharp dissection, monopolar cautery, or laser. In laser blepharoplasty, protective shields for the patient’s eyes must be used. The eyelid can be retracted using forceps with a 0.5-mm tip or by placement of a 6–0 silk suture. Gentle retropulsion on the globe helps to identify the fat compartments. The medial, central, and lateral fat pads are identified and conservative, individualized fat removal is accomplished. Hemostasis is achieved using monopolar or bipolar cautery or by defocused laser applications. Care must be taken not to damage the inferior oblique muscle that separates the medial from the central fat pocket. The endpoint for excision is reached when gentle retropulsion on the globe results in the anterior aspect of the orbital fat being flush with the orbital rim.

The tarsoconjunctival incision is left unclosed, but the inferior and superior edges of the tarsoconjunctival incision are properly apposed and the lower eyelid is pulled up to make sure there is no overlap between the cut edges of the conjunctiva.

Some surgeons routinely perform canthopexy in lower eyelid blepharoplasty. This can be done through a lower or upper eyelid; it eliminates unnecessary skin resection and is believed to restore tone and youthful contour. Through an incision in the upper eyelid crease, dissection is extended inferiorly to the level of the lateral orbital rim, leaving the periosseum intact. This stage of dissection can facilitate lateral fat pad resection if this was not fully addressed during lower blepharoplasty. The inferior limb of the lateral canthal tendon can be cut with scissors under visual inspection. A double-armed suture on a semicircular needle is placed 2 mm above Whitnall’s tubercle inside the orbital rim. The suture then travels through the orbital rim periosteum and emerges in half-buried horizontal mattress fashion through the inferior canthal tendon. Additional sutures can be used to tighten the orbicularis muscle to the superficial orbital rim. Alternatively, lateral canthal resuspension can be performed using the lateral canthal strip procedure described by Anderson and Gordy.

Wrinkles and excess of vertical skin can be dealt with by skin resurfacing techniques, such as chemical peeling and CO₂ or erbium–YAG laser resurfacing. These techniques are applicable in patients with Fitzpatrick skin types I–III. Patients with darker skin are at risk of pigmentedary changes; these can be managed by the pinch technique. Excess skin is crushed using a straight hemostat 1–2 mm subciliary and excised. Care must be taken to excise as little as possible of the orbicularis muscle. The skin is closed with a running suture. Regardless of the timing of laser treatment, transconjunctival

Fig. 4. A 40-year-old woman, before (left) and 2 years after (right) four-eyelid blepharoplasty, upper eyelid skin muscle removal and fat sculpting, and lower eyelid transconjunctival fat removal.
blepharoplasty with adjunctive CO₂ laser resurfacing results in improvement of lower eyelid bulging and skin wrinkling.\(^\text{18}\)

Another modification of lower blepharoplasty involves transcutaneous plication of the orbital septum.\(^\text{50}\) An interesting report describes nonsurgical treatment for pseudoherniation of orbital fat pads by phosphatidylcholine injection, with marked improvement over a 2-year period.\(^\text{105}\)

**COMPLICATIONS**

Severe complications, such as visual loss from orbital hemorrhage, orbital injection, or posterior optic nerve infarction have been described.\(^\text{38,127}\) Other possible complications are lower eyelid retraction with scleral show, lagophthalmos, and corneal exposure. As with upper lid blepharoplasty, patients might have various amounts of scleral show, tearing, ocular discomfort, and dry eyes. Various surgical techniques have been described to address scleral show, eyelid retraction, and ectropion after lower eyelid blepharoplasty, including free tarsconjunctival graft,\(^\text{27}\) grafting of autogenous hard palate mucosa,\(^\text{130}\) and cheek suspension using transossseous fixation and titanium screws.\(^\text{135}\) Temporary tarsorrhaphy can be used to prevent and treat scleral show and ectropion secondary to laser resurfacing or blepharoplasty.\(^\text{109}\)

Acquired strabismus that includes inconstant vertical deviation consistent with an inferior rectus paresis has been described.\(^\text{123}\) In some patients, upward rotation of the globe was found to be mechanically restricted.

**FAT REPOSITIONING**

In young people the eyelid-cheek complex is a single smooth convex profile. Aging causes descent of the globe and pseudoherniation of intraorbital fat, producing a double convex or tear trough deformity on the eyelid profile and a nasoju-gal groove at the medial aspect of the lower eyelid.\(^\text{43}\)

With advancing age this depression appears more prominent because of attenuation and descent of the orbicularis oculi and cheek fat, resulting in skeletonization of the orbital area and revealing the topographical contour of the inferior orbital rim.\(^\text{6}\)

Simple removal of orbital fat can result in a hollow appearance of the lower eyelid. Preservation of the lower orbital fat is a new concept in facial rejuvenation, designed to prevent the hollow appearance that may follow the removal of excess fat in lower eyelid blepharoplasty. Such preservation creates a smooth transition to the malar eminence, blending nicely into the upper face.\(^\text{12,43}\)

Aging causes progressive exposure of the underlying skeletal anatomy in the periorbital area, unlike in the lower facial area, where thicker soft tissue continues to cover bony landmarks.

**SURGICAL TECHNIQUE**

The basic surgical technique includes release of the arcus marginalis and advancing of the subseptal fat beyond the infraorbital rim and underneath the orbicularis muscle. The fat pedicles are temporarily externalized to the midface by suturing. They can be placed in the sub- or supra-periosteal planes, with no apparent effect on aesthetic results. This technique camouflages the lower orbital rim anatomy and provides more youthful rejuvenation of the midface.\(^\text{35,43,81}\)

Other methods suggested to correct tear trough deformity include orbital fat removal, fat injections or grafts, and alloplastic cheek implants. In general, trans-conjunctival fat repositioning results in leveling of the tear trough deformity, a smooth contour of the lower eyelid, and high patient satisfaction.\(^\text{63}\)

**COMPLICATIONS**

Possible complications are incomplete resolution of pigmentary changes (dark circles), temporary skin irregularities from fat and edema, hardening of repositioned fat, granuloma formation, restricted ocular movements, or new-onset diplopia.\(^\text{37}\)

**SUBORBICULARIS OCULI FAT / MIDFACE LIFT**

The midface lies between the lateral canthal angle and the top of the nasolabial fold. It includes the medial and lateral canthal tendon, lower eyelids, suborbicularis oculi fat pad (SOOF), malar fat pad, orbitomalar ligament, orbital septum, and origins of the zygomaticus major and minor muscles and levator labii superioris.\(^\text{88,99}\)

Volumetric distribution of the midface soft tissues is an important factor in the youthful appearance of the human face (Fig. 5). If these tissues are full relative to the lower face, the individual appears healthy and young.\(^\text{80}\) A fuller midface can be achieved by an open surgical or endoscopic technique.\(^\text{101,103,122}\) Indications for midface lift include lower eyelid retraction secondary to lower blepharoplasty, cicatricial ectropion, and paralytic ectropion due to palsy of the 7th cranial nerve.\(^\text{49,92,122}\)

Aesthetically, the goal of midface lift is to achieve facial rejuvenation by increasing malar fullness, decreasing skeletonization of the lower eyelid at the inferior orbital rim, and reducing prominence of the nasolabial and nasojugal (tear trough) folds.
SURGICAL TECHNIQUE

In patients with tear trough deformity, transconjunctival SOOF lift is adequate and yields good aesthetic results. Dissection is carried out in the preperiosteal plane, extending beyond the inferior margin of the tear trough deformity until the SOOF is identified. An anchoring suture from the SOOF pad to the periosteum of the infraorbital rim is placed along the width of the deformity. After adequate suspension, a single buried absorbable suture is used to close the conjunctival incision lateral to the cornea.32

When a more robust midface suspension is required, effective reshaping of the soft tissue of the aging midface necessitates freeing of the cheek soft tissue, both superficially and deeply, from its attachment to skin and bone. Incisions are made at the temporal scalp, inferior conjunctiva, and alveolar oral mucosa. Dissection is aimed at creating a temporal pocket, mobilizing the midface by subperiosteal dissection, and lifting the mobilized face to the deep temporalis fascia while securing the SOOF pad to the inferior orbital rim.122 Dissection is performed as far as the oral commissure inferiorly and toward the zygoma and lateral buttress of the maxilla, along the infraorbital rim, and around the infraorbital nerve in the subperiosteal plane. Care must be taken to identify and preserve the infraorbital nerve. In the lateral orbit, a small area of deep temporalis fascia is cleared near the lateral canthus. No dissection is carried out at the masseteric tendon or the zygomatic arch.80 Techniques used to re-shape the midface, once the subperiosteal tissue has been freed, include malar imbrication, insertion of suspension sutures into the deep temporalis fascia, and mechanical anchoring.

If the neck is to be treated, this is done before the cheek is lifted. To avoid traction of the midface, lateral plication of the superficial musculaponeurotic system (SMAS) is performed only after the midface has been adequately lifted.137

To avoid postoperative complications the following steps are suggested: Reattach the lateral canthus to its proper anatomic position; address the orbital fat via a transconjunctival approach to prevent middle lamellar scarring and orbital septum retraction; and place a suture at the inferior lateral orbital rim that stimulating the orbitomalar ligament that elevates the midface and suturing of the orbicularis oculi muscle.97

COMPLICATIONS

Possible complications include temporary facial nerve trauma (in up to 5% of cases), significant orbital edema, and chemosis especially when combined with lower blepharoplasty, prolonged swelling, and skin dimpling along the suspension sutures.102

LOWER FACE AND NECK REJUVENATION

Deep plane facelift techniques developed as surgeons became more aware that elevation of the deeper tissue layers of the aging face could achieve longer lasting and more natural results.3,58

SURGICAL TECHNIQUE

The procedure is best carried out under general anesthesia. The face and neck are infiltrated with tumescent solution.59 Incisions are marked and made through the temple hairline, above the ear and down a natural skin crease in the pre-tragal area, and continued postauricularly to the level of the superior conchal bowl. Pre- and postauricular skin flaps are elevated and over the sternocleidomastoid region and over a distance of 5–6 cm (2 inches) in the face, while taking care to dissect superficial to the greater auricular nerve. In the neck the platysma muscle is identified below the angle of the mandible, and dissection is extended to the submental region anteriorly and to the lowest neck rhytid. To prevent damage to the facial nerve, the deep plane is kept above the level of the

Fig. 5. A 65-year-old woman, before (left) and 8 months post (right) transconjunctival lower eyelid retraction as a result of lower blepharoplasty. Note marked improvement in lower eyelids position.
masseteric fascia. Care is taken to limit dissection to the undersurface of the platysma musculature in the SMAS flap. At the level of the malar eminence dissection is carried out toward the bone to identify the zygomaticus major muscle, and the SMAS flap is elevated anteriorly. Throughout the procedure this flap is kept above the anterior border of the parotid gland. Buccal fat can be resected as needed.

If needed, submental platysmoplasty with direct fat excision is performed (Fig. 6). An incision is made 2 cm posterior to the mandibular protuberance, the subdermal fat is lifter off the underlying muscle, and the skin flap is connected bilaterally to the pre-platysmal flaps. Fat and redundant muscle are removed, and buried sutures are used to reattach the muscle edges. Finally, the SMAS flaps are repositioned and sutured along a postero-superior vector. Prolene sutures are used to attach the deep plane flap by tucking it into the preauricular area and back to the mastoid fascia. The skin is slightly lifted to prevent puckering and the excess skin is trimmed. A drainage device is used in the early postoperative period. A light pressure dressing with fluffed cotton and Kerlex is applied.

COMPLICATIONS

Possible complications include hematoma, paresthesia, and facial nerve paresis. These can be avoided by careful and meticulous dissection and by operating only at the level of tissue planes known to be safe.

S LIFT

A recently developed technique requiring minimal incision for mid-lower face rejuvenation is performed via an S-shaped pre-auricular incision, followed by elevation of the facial skin and SMAS with the aid of two purse-string sutures.

**SURGICAL TECHNIQUE**

The procedure is performed on an outpatient basis and under local anesthesia. As in most facial rejuvenation procedures the operative area is infiltrated with tumescent solution to facilitate dissection and minimize bleeding. Incision sites are anesthetized with 1–2% lidocaine containing 1:100,000 epinephrine. Following the S-shaped incision, a limited skin flap is undermined in an oval area extending from 1 cm above the zygomatic arch to the mandibular angle caudally and 5 cm anteriorly. Dissection is in the subcutaneous plane. Superiorly the deep temporalis fascia is exposed, while care is taken not to damage the superficial temporal vessels. For the first purse-string suture a 2–0 nylon or prolene suture is inserted in a U-shaped fashion, descending to the mandibular angle and engaging the parotid fascia. The suture allows the anterior neck region to be lifted. The second purse-string suture, directed at a 30° angle, is extended to the edge of the undermined area, allowing the jowls to be lifted. The periorcular region is sutured under minimal tension.

A number of alternative approaches have been introduced for face and neck rejuvenation, and there is controversy over the relative advantages of the more extensive and the minimal techniques with respect to longevity and postoperative complications.

**Skin Rejuvenation**

**PHOTODAMAGE**

Exposure to the sun induces skin damage referred to as photoaging, which may be manifested clinically as wrinkles, dryness, irregular pigmentation, telangiectasias, brown spots, and seborrheic keratosis. Premalignant sun-induced lesions include actinic keratosis; malignant lesions include basal
and squamous cell carcinomas. Patients with photo-
induced skin damage should be examined period-
ically for premalignant lesions. Sun protection 
during childhood and throughout life has been 
shown to reduce the risk of malignant skin 
cancers.69,120 Ultraviolet A and B (UVA and UVB) 
contribute to pigmentary changes, as well as to 
wrinkles, telangectasias, and lentigines.68

Actinic keratosis, which is premalignant to squa-
mous cell carcinoma, can be treated with cryosur-
gery, topical 5% fluorouracil cream, and 
photodynamic therapy with aminolevulinic acid.73

The effects of photoaging can be reduced to 
a limited extent by the use of topical lotions 
containing alpha- and beta-hydroxyl acids that are 
exfoliants and moisturizers. Some of these materials 
contain 5% glycolic acid and 8% lactic acid, both 
shown to add to the improvement in roughness and 
mottled pigmentation.721 Topical vitamin A deriva-
tives (retinoids) can be used to improve fine wrinkles 
and irregular pigmentation.62 Peeling makes the skin 
more vulnerable to UV radiation, and therefore sun 
protection is of utmost importance after this pro-
cedure. Deep chemical peeling can be achieved by 
trichloroacetic acid 35%, higher concentration than 
50%, and phenol (Fig. 7). Possible complications of 
chemical peeling include keloids, hypertrophic 
scars, and hypopigmentation. Other modalities used 
to treat photoaging damage include cryosurgery, 
microderm abrasions, chemical and laser peeling, 
tissue augmentation by injectable fillers, and botuli-
um injection to treat dynamic rhytides.46,119

LASER

Photodamaged skin and acne scarring can be 
improved by treatment with different types of lasers: 
ablative (high energy pulsed or scanned) CO2 lasers, 
single or variable pulse or dual ablative/coagulative 
mode erbium:yttrium aluminum garnet (Er:YAG) 
lasers, non-ablative Q-switched neodymium:yttrium 
aluminum garnet (Nd:YAG), diode lasers, and 
combined wavelength systems. The pulsed Er:YAG 
laser has poor penetration and is therefore used to 
treat superficial rhytides; the CO2 laser is better for 
depth rhytides and scars.94

Pulsed CO2 laser resurfacing causes ablation of 
normal tissue with subsequent collagen regenera-
tion, and remodeling occurs by heat-induced 
collagen contraction. A similar degree of skin 
tightening can be achieved with the erbium laser. 
Laser-induced skin contraction is usually not long-
lasting; the postoperative decrease with the CO2 
laser ranges from an average of 42% 1 month 
postoperatively to 36% on average at 6 months. With 
erbium laser treatment the skin contraction is less 
but is more stable.28 With the advent of new-
generation ultra-pulse CO2 lasers, the skin can be 
successfully resurfaced with minimal risk or side 
effects.131

Laser resurfacing of the lower eyelid skin and 
periorbicular skin is done with the ultra-pulse CO2 
laser. After each pass with the laser, debris should 
be removed using saline-soaked gauze, and the area 
dried with dry gauze. One pass usually suffices for 
the pre-tarsal skin, whereas 2–3 passes should be 
applied for the pre-zygomatic skin and lateral crow’s 
feet area. After laser application the treatment area 
should be covered with a moist dressing.115

Fig. 7. A 42-year-old woman before (top), 5 days (middle) 
and 5 months after (bottom) trichloroacetic acid 25% peel for skin rejuvenation.
The Er:YAG laser is also used to treat periorcular skin deformities. In many cases, skin resurfacing by CO\textsubscript{2} or Er:YAG yields good results even without lower eyelid surgery. Combined use of Er:YAG and CO\textsubscript{2} lasers was recently described (Derma-K).\textsuperscript{90}

Because the eyelid skin is only 0.25 mm thick, two passes with decreasing power of the CO\textsubscript{2} laser are adequate for its removal. To avoid ectropion, the triangle below the lateral corner of the eye must be approached with restraint. An occlusive dressing with polyurethane film is applied. Epithelialization occurs after 6 to 7 days. Erythema lasts for several weeks after resurfacing with the CO\textsubscript{2} laser and for only 2 weeks with the Er:YAG laser. This is because the Er:YAG laser does not cause thermal damage; on the other hand, it does not induce collagen shrinkage, and deep wrinkles are therefore more successfully treated with the CO\textsubscript{2} laser. Promising results have been obtained with the CO\textsubscript{2}/Er:YAG combination laser, with post-treatment erythema of 3 weeks. Sun protection of the treated area is mandatory for 6 months.\textsuperscript{90}

Possible complications include persistent erythema, allergic dermatitis, mild post-inflammatory skin hyperpigmentation, hypopigmentation, and lid retraction.\textsuperscript{18}

**INTENSE PULSED LIGHT**

Intense pulsed light, a non-coherent light produced by a flash lamp, has been used in recent years to treat photodamaged skin. By using filters with different cutoff values, it is possible to select the desired wavelength; long waves that reach the deep dermal collagen tighten the skin, improving its texture. Vascular and pigmented lesions are treated by photodermal damage either through hemoglobin absorption or melanin-pigmented lesions. Thermal damage is avoided by controlling the duration of light pulses and the interval between them, the latter must be shorter than the thermal relaxation time in the target lesion in order to ensure its destruction.\textsuperscript{31} Intense pulsed light was recently shown to be effective and safe for treating senile pigmentation, telangiectasias, and rosacea, as well as for improving skin texture in facial and non-facial rejuvenation. Complications can include redness, blisters, swelling, scar formation, and hyperpigmentation.\textsuperscript{34,124,132}

**LASER HAIR REMOVAL (PHOTOEPILATION)**

Selective laser thermolysis is currently the treatment of choice for hair removal. By using a laser beam with a defined wavelength and pulse duration to specifically target the melanin, it is possible to selectively destroy the chromophore while protecting the surrounding tissue. Patients require a minimum of three treatments at 1.5- to 2-month intervals for body hair and five or six treatments for facial hair. The reported success rate at 6 months is 60–95\%.\textsuperscript{74} Lasers used for hair removal include long-pulsed alexandrite, long-pulsed diode, and long-pulsed Nd:YAG; the first two appear to be more effective than the last.\textsuperscript{5}

In addition, larger spot size appears to be more effective for hair removal, probably because it delivers more total energy per pulse and results in increased penetration.\textsuperscript{91} Possible side effects include pain, hyperpigmentation, blister or erosion, folliculitis, and hypopigmentation.\textsuperscript{8}

Other methods of hair removal include shaving, waxing, electrolysis, and chemical epilation.

**BOTULINUM TOXIN**

Botulinum toxin is one of the most powerful toxins known in toxicology. It acts via parasympathetic acetylcholine inhibition (chemodenervation), which prevents fusion of the acetylcholine-filled vesicle with the plasma membrane, thereby also preventing the release of acetylcholine into the synaptic cleft. The exotoxin produced from Clostridium botulinum temporarily paralyzes the mimic facial musculature.\textsuperscript{7}

Botulinum toxin was first used in 1973 and 1979 for the treatment of strabismus, and in 1985 the indication was extended to blepharospasm and dystonia.\textsuperscript{7,112–114} Aesthetic indications were added after patients noticed that treatment in the brow area produced a relaxed, unworried appearance (Figs. 8–10 ).\textsuperscript{15,113,128} Three commercial botulinum toxin preparations are currently available: Botox (botulinum toxin type A [C. botulinum type A toxin]; Allergan, Irvine, CA), Dysport (type A toxin–haemagglutinin complex; Ipsen, Maidenhead, Berkshire, UK), and botulinum toxin type B, available as Myobloc (injectable solution; Elan Pharmaceuticals, South San Francisco, CA).\textsuperscript{44,47}

Botulinum toxin, used alone or in combination with other modalities of facial rejuvenation, such as chemical peel, laser resurfacing, dermabrasion, or soft tissue augmentation, offers safe and effective treatment of upper face wrinkles. It has also been used in surgery for facial rejuvenation.\textsuperscript{47}

Dynamic changes are caused by muscle hypertonicity and are manifested as lines or rhytids of the forehead and glabellar areas. Improvement after intramuscular injection of botulinum (type A or B) first appears after 24–72 hours, reaches a peak by 1 month after injection, and lasts usually for 3–4 months, but might persist for 6–8 months or longer.\textsuperscript{17,86} Previous botulinum toxin treatment might extend the efficacy of additional BTX injections because of attendant muscle atrophy; it was
also noted that repeated injections prolong the clinical effect. Among the many cosmetic indications are lateral canthal lines (crow’s feet), horizontal forehead lines, brow ptosis, orbicularis oculi hypertrophy and periocular skin wrinkling, facial asymmetry, massteric hypertrophy to reduce a prominent mandibular angle, neck rejuvenation (platysmal bands), and decollete folds. Because of asymmetric results, cosmetic indications that include nasolabial folds and platysma and mouth frown are still a subject of controversy. As our understanding of the anatomy and combined mentalis and depressor anguli improves, the results of treatment are likely to be increasingly satisfactory.

Systemic complications are rare because clinical dosages of botulinum toxin are measured in nanograms, and as it is injected locally into the muscle, very little enters the systemic circulation. Complications can be classified as local, regional, or systemic. Possible systemic complications are thirst, flu-like illness, and mild urticarial rash, as well as potentiation of neurological diseases such as myasthenia gravis and amyotrophic lateral sclerosis. Rare reports include anaphylaxis and respiratory arrest. Patients with human albumin allergy should avoid treatment with botulinum toxin. Possible regional complications are unwanted weakness or paralysis adjacent to the point of injection, such as droopy eyelid, brow ptosis or elevation, diplopia in the periocular area from inadvertent orbital injection, lip drooling and asymmetry in the perioral area, dysphagia (after deep neck muscle injection), reduction in facial expressiveness, and a mask-like appearance. Local effects can include erythema, rash, ecchymosis, and hematoma.

Contraindications for botulinum toxin injection include pregnancy and lactation, neuromuscular diseases, peripheral neuropathy, and use of medications such as quinine, calcium channel blockers, penicillamine, or aminoglycoside antibiotics.

### FILLERS

Attempts have been made over the years to augment facial soft tissue for aesthetic and reconstructive purposes. Fillers are used for the treatment of deep wrinkles and non-dynamic furrows. They are also useful for correction of facial, bony, and soft tissue defects of congenital or traumatic origin, and in patients suffering from scleroderma, Romberg disease, facial wasting, or AIDS-associated lipodystrophy. Many materials have been used, including organic particles such as autologous fat, sea coral, and injectable bovine collagen. The latter, along with inorganic liquid silicone gel, have been used increasingly in recent years. None of the proposed materials has proved entirely satisfactory because of migration, host immune response, or transitory cosmetic improvement. Autologous fat is not permanent.
and its fate is unpredictable. The effect of soft tissue augmentation using fillers typically lasts 6 months.

The search for newer and better materials led to the introduction of polyacrylamide, which was considered biologically inert; however, recently reported severe granulomatous reaction to polyacrylamide casts doubt on this assumption. A filler commonly used in the United States is an injectable bovine collagen preparation. Other common fillers include PMMA (polymethylacrylate), microspheres, silicone oil, polyactic acid microspheres, and dextran microspheres. Recently, hyaluronic acid filler (Restylane; non-animal stabilized hyaluronic acid; Medicis Aesthetics, Scottsdale, AZ) was approved by the FDA. Long-term retention of its effect has been demonstrated in a mouse model using Restylane mixed with cultured human dermal fibroblasts (Fig. 11).

In a recent investigation of human host response to intradermal injection of various soft tissue fillers, all of the examined substances appeared to be clinically and histologically safe, but all showed host inflammatory reaction from encapsulated fibrous tissue, granulomatous reaction with giant cells, and chronic foreign body reaction. A less severe inflammatory response was obtained with polymethylacrylate particles, polyacrylamide, polyvinylhydridoxide microspheres, and calcium hydroxyapatite. Other fillers have also had destructive inflammatory effects on soft tissues.

Other possible complications of soft tissue augmentation include blindness and cutaneous necrosis from treatment in the glabellar area and arterial embolization following hyaluronic acid injection (Restylane).

**Summary**

In many ways cosmetic surgery is very different from the rest of ophthalmology. The goal of most ophthalmic procedures is to improve or preserve vision. The success of the surgery can be readily measured with visual acuity.

The goals of cosmetic surgery are more varied and success must be defined on a patient-by-patient basis. The most common goal of cosmetic surgery is to reverse anatomical changes that occur in the face with aging. Just as a successful ophthalmologist must understand the anatomy and physiology of vision a successful cosmetic surgeon must understand the anatomy and physiology of facial aging. The successful cosmetic surgeon must be able to listen to
a patient’s concerns about how their appearance has been altered by age, understand the underlying anatomical and physiological changes that cause these changes, describe to the patient what sort of success they might expect in reversing these changes, and then master and stay current on a number of rapidly evolving techniques.

It is a truly fascinating and challenging area of ophthalmology. For those who embrace the discipline it can be very rewarding.

**Method of Literature Search**

Medline and Medical Subject Headings search (1966–2007) was conducted using the following terms: eyelid, ptosis, blepharoplasty, eyelid bags, forehead, face-lift, midface-lift, neck-lift, rhytidectomy, browlift, chemical peel, blepharoplasty, facial implants, fat transfer, liposuction, botulinum toxin, fillers, Restylane, chemical peel, cosmetic surgery, aesthetic surgery. The search was limited to English language publications. All manuscripts’ abstracts were examined. Publications were included if they studied any aspects of cosmetic eyelid and facial surgery with emphasis on new surgical techniques and new cosmetic procedures. Comparative prospective studies were preferred; case-series were also included if they studied an important aspect of a specific cosmetic procedure. Abstracts identified were assessed for eligibility. If the abstract was unclear the full-text of the article was obtained and assessed.

**References**


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