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Department of  
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Vision Sciences

## Cosmetic Eyelid and Eyebrow Surgery

BY DAN D. DEANGELIS M.D., F.R.C.S.(C)

The art of ophthalmic plastic and reconstructive surgery has evolved considerably over the last few decades. Procedures that were previously the domain of the plastic surgeon have been incorporated into the practices of comprehensive ophthalmologists, ophthalmic plastic surgeons, and other subspecialty trained physicians. More importantly, these newer techniques necessitate a greater working knowledge of critical anatomical structures that require the boundaries of our surgical expertise to extend beyond the periorbital region.

The face is a key element of interpersonal recognition and emotion and is topographically organized so that the eyes and periocular region are centrally located. In this position, they are in a key position to reflect inner emotions and affect. Their importance is no more evident than in social circles, where individuals may comment and pass judgment on others solely on the basis of their facial and periocular features. Research has indicated that variations in facial architecture, most notably dermatochalasis, may be sufficient to elicit a negative impression about an individual's personal qualities and characteristics.<sup>1</sup> It is for this and other reasons that a great number of individuals are seeking cosmetic surgery.

The eyes and ocular adnexa are not isolated independent entities, but important structures that lie between a large musculocutaneous flap that extends anteriorly from the occiput to the most inferior limits of the platysma muscles on the neck. A complex subcutaneous network of connective tissue and muscle allows for harmonious movements of the facial structures. External forces such as trauma, aging, and gravity may all disrupt these architectural structures and cause varying degrees of change that have visible manifestations.

The large numbers of individuals who seek cosmetic surgery on an annual basis are reflected in statistics from the American Society for Aesthetic Plastic Surgery. There has been a steady growth in the number of cosmetic procedures performed every year since 1997 – by at least one million procedures annually – to a total of almost 8.5 million cosmetic procedures in 2001.<sup>2</sup> Although nonsurgical procedures such as botulinum toxin, laser resurfacing, injectable fillers, and microdermabrasion are becoming more popular, the number of traditional cosmetic surgical procedures also continues to increase. This issue of *Ophthalmology Rounds* focuses on two of these surgical procedures: blepharoplasty and endoscopic brow lifts.

### Cosmetic blepharoplasty

Blepharoplasty is the procedure of choice for patients whose main complaint is having either too much skin (dermatochalasis) and/or significant fat prolapse (steatoblepharon) in the eyelids. Excess skin is most commonly noted in the upper eyelid, while fat prolapse is more common in the lower eyelids. The thin consistency of the skin makes the redundancy and aesthetic issues more prominent. The mobile nature of the tissue also makes it one of the more likely locations to observe fine wrinkle formation. Adjunct modalities such as carbon dioxide (CO<sub>2</sub>) laser resurfacing and botulinum toxin may enhance and optimize the results in these patients. The art in surgically correcting dermatochalasis lies in the ability to improve the cosmetic appearance of the periocular region, while simultaneously leaving a minimum amount of eyelid skin and subcutaneous tissue to allow the eyes to properly close and protect the ocular structures.

Aesthetic or functional concerns may be of paramount importance to the patient with dermatochalasis. Aesthetic concerns may arise from comments about their 'tired' or 'worn-out' appearance or they may be truly functional in patients who must manually elevate excess skin in order to clear their visual axis. The patient may also notice a deficit in central visual acuity or a diminution of the central or peripheral visual fields, attributable to direct mechanical obstruction of the visual field (Figure 1). Female patients may complain of

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**Figure 1: A 70-year-old patient with severe dermatochalasis obstructing vision and reducing the visual field.**



having difficulty in applying eyeliner and mascara to the upper lids. Frontal or migraine headaches may also be a presenting complaint due to chronic overutilization of the frontalis muscles.

The etiology of dermatochalasis and many of the changes seen in the periorbital region is secondary to the aging process. With time, the collagen component of the thin tissues in the eyelids undergoes ultraviolet (UV)-induced, as well as age-related, degeneration. Collagenases, released from the damaged epidermis also contribute to degeneration and entanglement of the individual collagen fibers.<sup>3</sup> Underlying elastic fibers are also damaged by UV sun exposure, although a great proportion of this damage has already occurred in youth.<sup>4</sup> Gravitational forces also play a significant role in tissue redundancy. Chronological aging is accompanied by mechanical descent of the brows and the retro-orbicularis oculi fat (ROOF), contributing to upper eyelid tissue redundancy. Repeated contraction of the orbicularis oculi muscles over a period of many years contributes to orbital septal stretching, attenuation, and fat prolapse. The fat prolapse is more commonly seen medially in the upper lids, and centrally and laterally in the lower lids. Heredity and other environmental factors, such as smoking and nutrition, may also contribute to the appearance of the eyelids.

### *Evaluation*

The ophthalmic examination helps the physician decide if an individual is a suitable candidate for surgery. Visual acuity and visual field testing with the eyelids in their natural state and with the excess tissue elevated is essential to document significant visual acuity and/or visual field deficits attributable to the dermatochalasis. Examination for blepharoptosis may be difficult in the presence of significant dermatochalasis, but this is an important finding, as true eyelid ptosis is not addressed with standard blepharoplasty techniques.

Examination of extraocular motility is important to elicit functional deficits in upgaze. The utility of Schirmer's testing preoperatively remains an issue of controversy; however, it can provide important information about the status of the tear film.<sup>5</sup> Slit lamp examination for lagophthalmos, superficial punctate keratitis, and corneal erosions is helpful to document tear film status. Lower lid evaluation may reveal various combi-

nations of orbital fat herniation, rhytids, or excess lower lid skin. It is critical to examine the lower eyelids for signs of lower eyelid laxity and pre-existing lower eyelid retraction. Significant lower eyelid laxity may predispose patients to lower lid retraction and scleral show if not corrected prior to, or during, blepharoplasty surgery.

Preoperative management entails the identification of variables that may potentially lead to a less than optimal surgical outcome. First and foremost, the physician needs to determine whether the patient has realistic goals and reasonable expectations and whether blepharoplasty alone is the procedure of choice to deal with these issues. Patients are instructed to avoid aspirin, ibuprofen, and similar medications for at least 2 weeks prior to surgery since these drugs can cause bleeding problems during and after surgery. Inquiries into the use of herbal medications are important as constituents such as ginger, ginkgo, and Asian ginseng, are known to increase bleeding during surgical procedures.<sup>6</sup> Prophylactic antiviral agents are given if carbon dioxide (CO<sub>2</sub>) laser resurfacing will be performed. Patients are also told to stop smoking as it reduces circulation to the skin and impedes wound healing.

### *The principles of management*

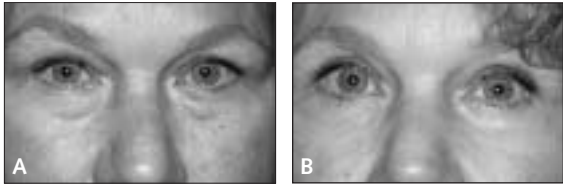
Traditionally, cutaneous incision with a scalpel has been the most favoured approach, but newer alternatives include radiofrequency devices and carbon dioxide lasers. The surgical approach to removing excess fat in the lower lids has also seen a paradigm shift. The subciliary approach to lower lid blepharoplasty was the gold standard to address lower lid dermatochalasis, and may still be the most appropriate procedure in some cases; however, alternative approaches were sought when it was recognized that the subciliary approach led to lower lid retraction and scleral show in some patients.<sup>7</sup> Simultaneous lateral canthal re-suspension, in addition to subciliary blepharoplasty, has also been advocated to reduce the incidence of lower lid retraction. Many surgeons have turned to transconjunctival lower lid blepharoplasty to reduce the incidence of these complications. Transconjunctival blepharoplasty has the advantage of allowing fat excision and removal with a significantly lower risk of lower lid retraction.

Occasionally, the removal of lower lid fat may result in an increase in the fine wrinkling and skin redundancy of the lower lids due to chronic stretching of the skin. These fine rhytids are difficult to manage with conventional blepharoplasty techniques and, for this reason, superficial laser resurfacing has been advocated as a useful adjunct to blepharoplasty. Carter et al have demonstrated that combining transconjunctival blepharoplasty with adjunctive CO<sub>2</sub> laser resurfacing reduces the incidence of post-operative wrinkles and enhances the ultimate cosmetic appearance.<sup>8</sup>

### *The technique for upper eyelid blepharoplasty*

At least 10 mm of eyelid skin should be left between the upper incision and the lowest brow hairs since excessive skin resection may pull the brows inferiorly or lead to problems with lid closure. Premedication may be facilitated with 5-10 mg of midazolam 15 minutes prior

**Figure 2: A. Preoperative and B. 4-month postoperative photos of a patient with moderate upper lid dermatochalasis after incisional blepharoplasty.**

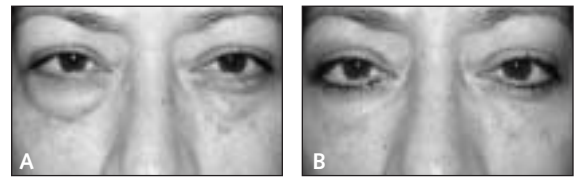


to surgery. Local anesthesia in the form of 2% lidocaine with 1:100,000 epinephrine and hyaluronidase is used for subcutaneous infiltration. A scalpel or the CO<sub>2</sub> laser is used to make the skin incisions, precisely following the contours of the preoperative markings. The skin and orbicularis muscle is excised as a single layer to expose the orbital septum. Meticulous hemostasis is essential. After the orbital septum is incised, the pre-aponeurotic fat is visualized overlying the levator aponeurosis. The fat is gently separated from its attachments to the underlying levator aponeurosis and excised with hemostatic techniques. Hemostatic fat excision can be performed with handheld cautery, radiosurgical devices, bipolar cautery, or lasers. Deeper sculpting of the retro-orbicularis oculus fat (ROOF) may also be necessary in some cases. After adequate hemostasis has been achieved, skin closure can be performed with 6-0 non-absorbable or fast-absorbing gut sutures. The use of supratarsal fixation in the final wound closure facilitates the creation of a cosmetically pleasing lid crease as the tissues heal (Figure 2).

#### *The technique for transconjunctival lower eyelid blepharoplasty*

The transconjunctival surgical approach is the procedure of choice if there are primarily prominent fat pockets without redundant lower lid skin or deep rhytids. The prominent fat pads should ideally be marked with the patient upright, as their prominence is lost when the patient is in the recumbent position. After the application of topical proparacaine drops into the conjunctival fornices, local anesthesia is given transconjunctivally into the fat pads. A Desmarres retractor is used to retract the lower lid and a lid plate is placed in the inferior fornix to protect the globe. All instruments used in blepharoplasty surgery with the CO<sub>2</sub> laser must be non-reflective. An incision through the conjunctiva and lower lid retractors is then made with the CO<sub>2</sub> laser approximately 5 mm below the inferior tarsal border. The medial, central, and lateral fat pads are identified with additional dissection through the lower lid retractors. Fat visualization can be optimized by gentle pressure on the globe. The orbital fat pads are excised with particular attention to hemostasis. Great care must be taken in sculpting the medial and central fat pad as the inferior oblique muscle lies between them and trauma to the muscle may lead to diplopia. The lower lid is then returned to its original position and its contour is re-evaluated. If necessary, more fat can be excised from the

**Figure 3: A. Preoperative and B. 6-month postoperative appearance of a patient after transconjunctival lower lid blepharoplasty with CO<sub>2</sub> laser resurfacing.**



prominent areas or, alternatively, fat pearls can be reintroduced into more depressed areas of the lower lid.

If adjunctive CO<sub>2</sub> laser resurfacing is to be performed, additional infiltrative anesthesia is given subcutaneously. A non-reflective metal scleral protector is placed on the globe and the resurfacing is performed with a CO<sub>2</sub> laser using surgeon-specific settings. The rhytids are treated in a confluent manner perpendicularly to the eyelid margin. The debris is subsequently gently removed with a saline-soaked gauze. If necessary, additional passes can be performed to achieve the desired depth of treatment and skin tightening. Finally, antibiotic ointment and cellophane dressings are placed over resurfaced areas (Figure 3).

#### *Post-operative care*

Cool topical compresses and antibiotic ointment are the mainstays of management in the immediate postoperative period. Systemic antibiotics and a rapid tapering dose of corticosteroids may also be prescribed on an individual basis. Patients undergoing laser resurfacing routinely receive postoperative systemic antibiotics, antivirals, and often prednisone. These patients also need to be aware of protecting all treated areas from the sun. Suture removal (if needed) is usually performed between 5 to 7 days post-operatively. Patients are instructed to avoid heavy exertional activities within the first week after surgery to reduce the incidence of postoperative hematomas and edema.

#### *Complications*

The most devastating complication after blepharoplasty surgery is orbital hemorrhage with blindness. The incidence is reported to be 0.04%, although this figure is probably underestimated because of underreporting. The etiology may be multifactorial, but probably includes excessive traction on the anterior fat pads combined with poor intraoperative hemostasis and visualization. This leads to optic nerve compression with secondary optic nerve ischemia. Management includes early diagnosis, lateral canthotomy and cantholysis, and topical and systemic pressure lowering agents to relieve the ischemia. Rarely, orbital decompression may be necessary. Local soft-tissue complications more often relate to excessive skin or fat removal rather than insufficient skin and fat removal. A small amount of lagophthalmos is not uncommon and usually resolves after eyelid surgery, but pronounced lagophthalmos may lead to ocular irritation, exposure keratopathy, and infectious

keratitis. This may be worsened with inadvertent damage to or excision of the lacrimal gland intraoperatively. A more refined superior sulcus may be more acceptable in women than men, but excessive fat removal may lead to a cosmetically displeasing hollow superior sulcus. Asymmetric or multiple eyelid creases may result from poor preoperative markings or poor incision placement.

With lower lid rejuvenation, excess skin removal in the presence of horizontal lid laxity can result in a "round eye" with lateral canthal dystopia and ectropion. Addressing this problem may require middle lamellar release, a spacer to the posterior lamella, a mid-facial resuspension procedure or, occasionally, a skin graft to the anterior lamella. Lastly, because of the proximity of the inferior oblique muscle to the central fat pocket in the lower lid, transient diplopia can also occur postoperatively.

### Endoscopic brow lift

The role of the brow position in midfacial aesthetics has been largely ignored and underestimated. Its key movements have profound effects on facial animation and expression. Since they occupy the upper limits of the midfacial region, abnormal positioning can lead to asymmetry and functional and aesthetic concerns. As with eyelid surgery, the goal of brow rejuvenation is to offer a youthful refreshed look to the periorbital area. The correction of brow ptosis may also help to improve horizontal lines and furrows by removing muscles and tissues that cause frowning.

The open coronal browlift has been the gold standard for brow rejuvenation for decades. Surgeons have favoured this method because it allows clear exposure of all of the important anatomical structures, particularly for those without the appropriate endoscopic instruments or are uncomfortable with the technology or the accompanying learning curve. Although some surgeons still prefer this technique for brow rejuvenation, it is clear that the endoscopic approach is becoming more favoured. The endoscopic technique evolved from experience with more complex facial rejuvenation procedures.<sup>9</sup> In fact, some reports suggest that the results of this approach may be equivalent to, or even surpass, other methods of forehead rejuvenation.<sup>10,11</sup> The clear advantages of the endoscopic approach include much smaller incisions that result in less scarring, numbness, bleeding, and alopecia, and a much quicker recovery period than with the coronal approach.

### Evaluation

Determining which candidates are suitable for this procedure is once again critical. Patients who state that lifting their brows improves their vision may actually need blepharoplasty and/or blepharoptosis repair. A browlift in the presence of ble-

pharoptosis will do nothing to clear the eyelids from the visual axis. Similarly, the patient with dermatochalasis and involuntional brow ptosis who decides that he or she wishes to proceed with blepharoplasty alone must understand that there may be further brow descent postoperatively. In addition to carefully scrutinizing brow contour and position, evaluation of the hairline position is also essential as patients with very high hairlines may benefit from the endoscopic approach over an open coronal approach. Lastly, differences in brow contours must be appreciated: men's brows have a relatively flat and low profile, while women's brows are usually arched at the lateral third.

### Technique

Endoscopic brow lifts can be performed under general anesthesia or under conscious sedation. Intravenous sedation with midazolam and fentanyl and local analgesia with a combination of short- and long-acting agents can provide sufficient anesthesia for the duration of the procedure. Local nerve blocks and injections in a vascular tourniquet fashion help to maintain hemostasis during the procedure. Five incisions are typically made in the scalp: 1 central incision, 2 paracentral incisions, and 2 temporal ones. The incisions are carried down to the periosteum centrally and through skin and subcutaneous tissue to the level of the superficial layer of the deep temporal fascia temporally. Since the endoscopic approach is so dependent on instrumentation for visualization, the relatively bloodless subperiosteal plane of dissection is ideal and offers easy access to all key landmarks (Figure 4).

Although there are many important issues in endoscopic brow surgery, none is more critical than understanding the course of the facial nerve in the various connective tissue layers. Damage to this nerve along the frontal or zygomatic branches can lead to permanent facial paralysis. To achieve complete scalp mobility, the temporal dissection cavities must be connected to the central subperiosteal dissection cavities. A temporal-to-central dissection plane ensures that the facial nerve remains superficial and there can be no inadvertent injury to the facial nerve.

Periosteal release is also an important key to any successful endoscopic brow lift. Adequate periosteal release along the entire length of the supraorbital rims allows for full mobility of the myocutaneous flap. This entails dissecting to the occiput and from ear to ear to allow complete scalp mobilization posteriorly. Endoscopic periosteal release can be performed with either the CO<sub>2</sub> laser, a sharp periosteal dissector, or endoscopic forceps. In addition, the corrugator and procerus muscles need to be completely released in order to achieve a smooth forehead contour and allow the medial brows to be raised superiorly. In the past, this was traditionally performed with endoscopic forceps,

**Figure 4: Avascular subperiosteal dissection plane utilized during endoscopic brow lift. The endoscope is pointed inferiorly towards the supraorbital rim. The small arrow represents the frontal bone and the larger arrow points to the reflected periosteum superior to the neurovascular bundle**



but experiences with endoscopic CO<sub>2</sub> laser-assisted ablation have shown this method to be superior to manual resection.<sup>12</sup> The laser allows for simultaneous controlled hemostasis and relaxation of coagulated brow depressors. Additionally, augmentation of glabellar muscle resection with intraoperative botulinum toxin type A can provide long-lasting relaxation during periosteal adherence.

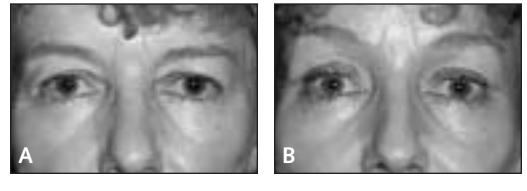
The final step in an effective endoscopic browlift is calvarial fixation, of which both absorbable and permanent methods have been described. Titanium fixation screws loaded with 2-0 polyglyconate sutures can be easily placed in the 2 paracentral incisions and affixed to the outer cortex of the calvarium. After threading the sutures through a free dura needle, the scalp is placed on posterior tension and the needle is used to engage the periosteum at the anterior incision edge. Lateral brow stability is achieved via myocutaneous fixation with a 2-0 polyglycolic acid suture to the temporalis fascia. Skin staples are used to close the superior skin incisions.

If lateral brow ptosis is prominent and a concern, a resection of the scalp tissue through the temporal incision can achieve more aesthetic results. This is necessary in some cases as the lateral third of the brows is subject to unopposed depression from the orbicularis oculi muscles, and there is no frontalis muscle laterally to assist with brow elevation (Figure 5).

#### *Post-operative care*

Patients are given one full liter of Ringers lactate solution intravenously in the post anesthetic care unit prior to discharge to combat the fluid redistribution that often occurs. Routine use of oral corticosteroids help to reduce post-operative swelling, while prophylactic oral antibiotics help reduce the incidence of infection. Skin staples are removed one week later.

**Figure 5: A. Preoperative and B. postoperative photos of a patient before and 6 months after endoscopic brow lift. Note the more youthful, relaxed appearance to the periorbital region.**



#### *Complications*

The endoscopic brow lift has minimal risks and potential complications. The risk of facial nerve paralysis is small and dependent on the surgeon's familiarity with the anatomy of the various tissue planes. Most commonly, the facial paralysis is temporary and recovery is seen within 3 to 6 months. Hair follicles are known to be exquisitely sensitive to heat and thermal cautery. Applying excessive cautery to the underlying tissues can result in permanent hair follicle damage and alopecia. The surgeon might also induce alopecia by transverse incisions across the base of hair follicles and wound closure under excessive tension. Rarely, infection and bleeding can also occur.

#### **Summary**

Surgical approaches to periorbital rejuvenation have expanded to parallel the introduction of new technologies to medical practice. This also imparts a greater responsibility on the surgeon to have a thorough knowledge and comfort level not only with the instrumentation, but also the detailed anatomy of these specific areas. With appropriate pre-operative evaluation and careful attention to intraoperative technique and postoperative management, complications can be avoided and an optimal result can be achieved.

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## Abstracts of Interest

### Endoscopic Brow Lift: A Retrospective Review of 628 Consecutive Cases Over 5 Years.

CHIU E, BAKER DC; NEW YORK, NY

In this review of the largest series of endoscopic brow lift procedures to date, the authors surveyed the plastic surgeons from one institution on their experiences. Plastic surgeons from the Manhattan Ear Nose and Throat Infirmary performed a total of 628 cases between 1997 and 2001. Of all respondents, 75% of surgeons occasionally or regularly continue to recommend endoscopic brow lifts. Although the number of endoscopic procedures diminished towards the end of the study period, the absolute number of procedures continue to be greater than open coronal browlifts. Interestingly, surgeons in practice less than five years performed endoscopic brow lifts twice as often as others in the group, reflecting the acceptance of newer procedures and innovations with younger surgeons. The majority of surgeons also prefer to enhance their surgical results with botulinum toxin within six months of the surgery. The authors conclude that although patient and physician acceptance of this procedure is high, there is still room for improvement in the surgical approach to brow ptosis.

*Plast Reconstr Surg* 2003;112: 628.

### Lower Eyelid CO<sub>2</sub> Rejuvenation

CARTER SR, SEIFF SR, CHOO PH, VALLABHANATH P; SAN FRANCISCO CA

Almost all the existing articles in the peer-reviewed literature pertaining to cosmetic eyelid surgery discuss preoperative evaluation to surgical techniques and refinements to long term outcomes. Very few authors have detailed the results of a randomized, prospective clinical study of cosmetic eyelid surgery patients. Dr. Carter and her colleagues have examined results of transconjunctival lower lid blepharoplasty with and without CO<sub>2</sub> laser resurfacing in a prospective manner. Results were documented with standardized photographs and graded by a masked examiner. Transconjunctival lower lid blepharoplasty alone was highly effective in the reduction of lower lid bulging but did cause an increase in lower lid wrinkling in 46% of patients. When adjunct CO<sub>2</sub> laser resurfacing was performed after transconjunctival blepharoplasty, there was a statistically significant improvement in lower lid wrinkles. The authors conclude that transconjunctival blepharoplasty and CO<sub>2</sub> laser resurfacing affords excellent results and is an alternative to traditional transcutaneous blepharoplasty.

*Ophthalmology* 2001;108:437-441.

## Upcoming Department Events

January 15, 2004

VPP – Dr. Susan Swiggam, Ottawa, Ontario  
*Under the Doctor Umbrella – Ethical and Legal Dilemmas in Delegation to Medical Trainee and Others*

February 26, 2004

VPP – Dr. Alan Crandal, Salt Lake City, Utah  
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Dr. Frank Buffam, Vancouver, British Columbia  
*Management of Ophthalmic Complication of VII Palsy*

April 2, 2004

Jack Crawford Day Hospital for Sick Children  
Contact: Karen Martin 416-813-8942 or  
karen.martin@sickkids.ca

April 22, 2004

VPP – Dr. Donald Fletcher, Birmingham, Alabama  
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