Chapter 31: Blepharoplasty

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The eyes play a primary role in human communication. When introduced to a person, one usually notices the other individual's eyes first, and during conversation the participants' eyes are focused on each other for a major part of the time. The eyes are capable of expressing the full range of human emotion - from anger to happiness, from hatred to love. The contour and movement of the skin, muscles, soft tissue, brow, and lashes, rather than the globe, allow the eyes to convey these expressions.

Abnormalities of the eyelid can occur in any age group and for a variety of reasons. In adolescents and young adults an overabundance or pseudoherniation of orbital fat may cause severe bagginess of the upper or lower lids. Many young women exhibit "bags" in the lower lid at an early age. This condition causes a sleepy, heavy, or full look to the eyes and is generally thought to be hereditary. These abnormalities appear as early as the late teen years or early 20s, and often they progress to being quite obvious in patients in their early 30s (Fig. 31-11).

The aging process can affect all of the tissues surrounding the eye. Many consider these changes normal and acceptable, and in certain individuals some of the changes are considered attractive. However, in a large group of people these signs of aging are a focus of concern (Fig. 31-2). Many changes can occur in both the upper and lower lids, including (1) progressive loss of elastic tissue of the eyelid skin; (2) skin changes caused by repeated sun exposure, (3) changes in the amount of collagen in the skin, (4) gravitational forces, (5) hypertrophy of the orbicular eye muscle, and (6) age-related weakening of the orbicular muscle. During the middle years the characteristic changes of aging occur in the skin, producing extra skin folds, wrinkles, weakening of the orbital septum, and ptosis of the brow. These may be seen in conjunction with bulging of the periorbital fat.

Blepharoplasty is a surgical procedure that is performed to modify these conditions. Although the operation has been associated with the correction of the effects of aging, it is well suited to younger women for the correction of hereditary abnormalities of the lids. Eyelid surgery can make a dramatic improvement in the appearance of women in this younger age group.

History of Blepharoplasty

Like many surgical techniques, blepharoplasty has roots in ancient times. The first mention of this technique was probably made by Aulus Cornelius Celsus, a first-century Roman. He described the excision of skin of the upper eyelids for "relaxed eyelids" in *De Re Medicus* (25-35 AD). As early as the tenth century in Arabia, surgeons devised ways to excise excess skin folds in the upper lids that caused visual impairment.

Von Graefe first used the word *blepharoplasty* in 1817 to describe a technique for repairing deformities caused by resection of cancer in the eyelids. In the nineteenth century Europeans such as Beer, Mackenzie, Albert, Graft, and Dupuytren advocated excision of excess upper eyelid skin. In 1844 Sichel provided the first accurate description of herniated

orbital fat.

In the early 1990s surgeons in the USA began to write about eyelid surgery. In 1907 Conrad Miller wrote *Cosmetic Surgery and the Correction of Featural Imperfections,* the first book on cosmetic surgery. His 1924 revised edition contains diagrams of incisions for upper and lower eyelid surgery that are similar to those used today. In the late 1920s French surgeons began advocating the removal of herniated orbital fat for cosmetic reasons; fat removal has been included as an integral part of blepharoplasty since the 1940s.

In the early 1950s Castenares described in detail the fat compartments of the upper and lower eyelids, although his work has been disputed in the last several years based on dye studies in cadavers (Barker, 1977). In the 1970s many refinements in technique were made, including the creation of a new supratarsal fold, a refinement in the crease line, and fixation and suspension techniques for lower lid blepharoplasty. The importance of careful evaluation of the hypertrophied orbicular muscle and its excision in blepharoplasty has also been recognized (Castenares, 1977).

Anatomy of the Orbit

The otolaryngologist - head and neck surgeon should have a good working knowledge of all the structures of the orbit.

Bony anatomy

The orbit is formed by seven bones of the skull: the frontal, zygomatic, maxillary, greater and lesser wings of the sphenoid, palatine, lacrimal, and ethmoid. In this bony compartment sits the globe and its contents; the first, third, fourth, fifth, and sixth cranial nerves and their associated vessels; the periorbital fat; the muscles that control movement of the globe and lids; and the lacrimal apparatus and drainage system.

Surface anatomy

The *lid crease* is the line created by the insertion of levator aponeurosis and the orbital septum into the orbicular eye muscle and subcutaneous tissue. This crease lies at the level of the upper edge of the tarsal plate and usually falls 9 to 11 mm from the lash line (Fig. 31-3). This line and its location are aesthetically important. When the lid crease is significantly closer to the lash line, the eye takes on a heavy, full, sleepy appearance. In women a smooth exposed area from the lash line to the lid crease allows for easy and successful use of eye makeup. This crease is part of the focus of the blepharoplasty operation. In the Asian eye this crease must be created if a more occidental appearance of the eye is desired.

The *lid fold* is that tissue above the lid crease that may protrude and prolapse over the lid crease, obscuring it (Fig. 31-4) and even covering the lashes. This lid fold may extend the entire horizontal distance of the upper lid, or it may occur primarily laterally or centrally. The fold may be composed of excess skin, hypertrophied orbicular muscle, redundant soft tissue, prolapsed lacrimal gland, herniated orbital fat, or any combination of these. Understanding the anatomy of baggy eyelid preoperatively is important so that the surgeon can make an accurate diagnosis and design procedure to correct the abnormality. For example, removing

only skin from an upper eyelid that has a hypertrophied orbicular muscle and redundant soft tissue will not result in the most pleasing postoperative result. Part of the blepharoplasty is designed to keep the lid fold from prolapsing, obscuring or partially covering the lid crease and the skin above the tarsal plate. The operation should focus on that area where reshaping and resculpturing of the tissues will give the best surgical result.

The *skin* of the upper lid is extremely thin, loose, and mobile over the deeper structures. This thinness is essential for normal lid function and appearance. With aging the skin loses elasticity and forms redundant tissue. Because eyelid skin is very well nourished, healing occurs quickly and scar formation is very favorable. This thin, smooth skin becomes thicker, coarser, and more sebaceous lateral to the bony orbital margins. Blacks (even those who form keloids elsewhere) do not form keloids on the upper lids as long as the incision is not carried into this thicker skin.

Orbicular eye muscle

Beneath the skin and the thin subcutaneous tissue lie the elliptic fibers of the orbicular muscle. The muscle has three distinct bands that end in the medial and lateral canthal tendons (Fig. 31-5).

The *pretarsal muscle* lies directly over the tarsus. The *preseptal muscle*, which lies over the orbital septum, is often modified in blepharoplasty. The *orbital muscle* overlies the bony margin of the orbit and blends superiorly with the frontal and corrugator muscles.

The heads of the pretarsal muscle form the medial canthal tendon that attaches to the anterior lacrimal crest. The heads of the preseptal part of the muscle attach to the tendon. The heads of the pretarsal muscle join laterally to form the lateral canthus, which inserts at the orbital tubercle just behind the orbital rim. The heads of the lateral preseptal muscle join each other superficially to the tendon to form the lateral palpebral raphe. The orbicularis muscle, which closes the lid, is quite strong. It may become hypertrophied and redundant, causing a fullness of the upper or lower lid. The muscle receives innervation from the seventh cranial nerve (CN VII).

Partial resection of the orbicular muscle may be accomplished during blepharoplasty. Care should be taken not to injure underlying structures. Conservative resection maintains good apposition of the lids in the closed position as well as correct movement of the tear film.

Just deep to the orbicularis muscle lies the *orbital septum* (Fig. 31-6). This is a thin sheet of fibrous tissue that originates from the superior orbital rim periosteum and hangs like a curtain across the lid. It joins the levator aponeurosis by interdigitating fibers at the level of the upper edge of the tarsal plate. The septum can be identified by placing slight traction on the lid margin. The tension transmitted to he brow can be palpated. The septum keeps the orbital fat in its posterior location. Weakening of the septum from aging, from hereditary predisposition, or from trauma may cause prolapse of the orbital fat that lies behind it.

Orbital fat

The orbital fat lies deep to the orbital septum (Figs. 31-6 and 31-7), providing a cushion and flotation to the structures of the orbit. It is lobulated and loosely supported and contains many small blood vessels and nerves. The fat separates the orbital septum fro the levator aponeurosis and muscle. The upper lid has two fat compartments, central and nasal. The central is the larger, and its fat is yellower than the lighter-colored, more dense fat of the nasal compartment. The lower lid is believed to have three fat compartments: a small medial, a small temporal, and a fairly large central compartment. Again, the fat in the medial compartment is lighten in color and more dense than the fat in the other compartments. The orbital fat does not seem to be related to other body fat, since the quantity remains relatively constant regardless of obesity or weight loss. It is a static structure and once removed does not regenerate. As mentioned previously, Castenares described these compartments in the early 1950s, although some of his findings have been disputed by studies done in the 1970s. Regardless, the surgeon will find it helpful to think of fat distribution in this compartmentalized fashion while planning the operation. The orbital septum lies anteriorly to the fat pocket, and the levator aponeurosis lies posteriorly to it.

Levator muscle

The primary elevator of the eyelid is the levator muscle (Fig. 31-6). Problems with proper function of this muscle produce ptosis. The muscle originates from the orbital periosteum and passes forward above the superior rectus muscle. Gradually it widens and forms a tendon that fans out further to form the levator aponeurosis. This extends the full width of the lid at the level of the upper tarsus. The tendon then fuses with the orbital septum, and together they insert in the anterior third of the tarsus. The fibers from the aponeurosis blend with those of the orbital septum at the level of the superior border of the tarsus and insert into the orbicular muscle, the subcutaneous tissue, and skin to produce the lid crease. The third cranial nerve (CN III) supplies the levator muscle.

Müller's muscle

Müller's muscle is a smooth muscle that originates from the belly of the levator aponeurosis and inserts in the retrotarsal margin (Fig. 31-60. It receives innervation from the sympathetic system. Because of its extremely friable nature and its adherence to the levator muscle, few surgeons are able to isolate it as a distinct entity.

Lacrimal gland

The lacrimal gland is divided into two lobes that lie in the lacrimal fossa of the upper temporal portion of the bony orbit (Fig. 31-7). The secreting ducts empty into the lateral aspect of the superior conjunctival fornix. Tears pass from the ducts into the upper lateral cul-de-sac and then move across the cornea to empty into the lacrimal drainage system.

Tarsal plate

The tarsus is often called the skeleton of the eyelid (Fig. 31-6). It is a fibrous plate that is approximately 10 mm wide in the central upper lid and narrows medially and laterally.

The tarsus of the lower lid is a bit narrower, from 4 to 5 mm in the center. The tarsal plates extend from the lateral commissure to the punctum. Each tarsus contains numerous meibomian glands that empty into the ciliary border. The tarsus and conjunctiva form the most posterior part of the lids.

Conjunctiva

The conjunctiva, which is a mucous membrane containing mucus-secreting goblet cells, is firmly attached to the posterior aspect of the tarsus. It covers the tarsus and Müller's muscle and reflects on itself in the upper fornix. It then extends down onto the globe as far as the limbus. As the levator muscle contracts, the tarsus is pulled upward and backward, and the retrotarsal margin closely follows the globe.

On the lower lid is a fine *gray line* (similar to the vermilion-cutaneous border of the lip) that separates the anterior and posterior parts of the lid (Fig. 31-8). Anteriorly the surface is stratified squamous epithelium containing the eyelashes and the sweat and sebaceous glands. Posterior to the gray line the surface changes to low stratified columnar epithelium containing meibomian glands. The gray line is an important surgical landmark in lid reconstruction or shortening. The sensory innervation of the lid comes from branches of the first (upper lid) and second (lower lid) divisions of the trigeminal nerve.

Terminology

Some variety has occurred in the application of certain terms as they relate to conditions of the upper and lower eyelids. A certain amount of confusion has existed regarding the term *blepharochalasis.* It has been used as a diagnostic term to describe virtually any degree of excess skin or fat of the eyelids. This term should be reserved for a rare disorder that usually occurs in young women and is associated with swelling and edema of the lids with progressive tissue breakdown. This produces prolapse of the orbital fat (and perhaps the lacrimal gland), causing drooping of the lid. *Dermachalasis* means relaxation of skin (baggy skin). It is associated with both the aging process and variable amounts of fat herniation and prolapse. *Blepharoptosis* (drooping eyelids) is caused by malfunction of the levator muscles.

Little general agreement exists as to what the various conditions of the eyelids should be called. Perhaps the term *baggy eyelid,* as Rees (1980) and others use it, is the most descriptive, albeit the least scientific.

Diagnostic Assessment

Patient history

The first step toward successful blepharoplasty involves careful and accurate diagnosis of the anatomic problems of the eyelids. One can then explain to the patient how surgical techniques may improve these conditions. If such improvements coincide with the patient's expectations, a successful operation and result can be anticipated.

The history should include a careful review of the patient's general medical history. Previous surgery, allergies, medications, and tobacco and alcohol habits should be noted.

Because certain systemic diseases cause abnormalities of the orbits or lids, the history must be done thoroughly to include these conditions. Thyroid disease can produce several signs in the orbital area. Hyperthyroidism may cause various degrees of exophthalmos or proptosis, and intermittent edema and tissue fibrosis can suggest hypothyroidism. These signs may also be idiopathic or familial. Unilateral exophthalmos or proptosis suggests an occult orbital lesion that should be ruled out. Cyclic hormone levels can cause intermittent eyelid edema in women, which may or may not be related to the menstrual cycle and associated fluid retention. Allergy may cause intermittent swelling and dermatitis of the eyelid skin as well as recurrent periorbital edema. Certain localized conditions, such as lymphangiomas, hemangiomas, neurofibromas, lipomas, and foreign body reactions, may result in swelling of the eyelids. Chronic renal disease and diabetes may affect postoperative healing and increase the chance of infection. Preexisting healing and increase the chance of infection. Preexisting eye disorders, such as glaucoma, problems with the visual fields, or visual acuity, must be thoroughly evaluated and may be contraindications to blepharoplasty.

Before the examination is begun, the surgeon should carefully question the patient about what bothers the patient most about the eyelids and what the patient would like to see changed. The answers provide a focus for the examination and discussion of any proposed operation.

Physical examination

After taking the history, the surgeon begins the examination by carefully assessing the full face, noting any ptosis or asymmetry of the eyebrows or eyelids. Any asymmetries should be pointed out to the patient, because, if not demonstrated before surgery, these areas may be the focus of concern and dissatisfaction postoperatively (Fig. 31-9).

In the upper eyelid the surgeon should check for the presence of excess skin, herniated orbital fat, ptosis, asymmetry of the lid and brow, prolapsed lacrimal gland, and eyelid edema. The upper lid skin can be grasped with a fine forceps to demonstrate the amount of excess skin and redundant soft tissue and orbicular muscle (Fig. 31-10). While one hand is elevating the brow, gentle pressure on the lower eyelid can demonstrate protrusions of the orbital fat in the nasal and central compartments of the upper lid (Fig. 31-11). Generally the surgeon can find the natural eyelid crease by lifting the patient's eyebrow and asking the patient to look first downward, then slightly upward, and back downward. Fullness of the upper lid in the temporal region is often the result of a prolapsed lacrimal gland or fat in the lateral temporal upper lid.

Examination of the lower eyelid is accomplished much the same way. Excess skin may be manifested by a crepelike quality of the skin (Fig. 31-12). Gentle pressure on the globe can demonstrate the pockets of herniated fat (Fig. 31-13). An important part of the lower lid examination is determination of the strength of the lower lids. Laxity of the lower lid is evaluated by pulling the lower lid away from the globe and observing how quickly it snaps back toward the eye (Fig. 31-14). If the lower lid is quite slow to snap back, one must assume that significant lower lid laxity exists. If the tarsus can be easily pulled 6 mm or more away

from the globe, serious weakness or laxity of lower lid exists, and a full-thickness horizontal shortening of the lid should be considered at the time of blepharoplasty. This will help prevent ectropion of the lower lid. Weakness of the lower lid seems to be more common in men than women. Some people have fullness immediately under the lash line of the lower lids that signifies hypertrophy of the orbicular muscle (Fig. 31-15). Correction of this problem requires excision of part of the muscle.

Eyelid edema can be a diagnostic problem, and its cause must be determined. The examiner can differentiate edema from herniated orbital fat by applying pressure to the eye. Herniated orbital fat should move in and out with digital pressure on the globe; eyelid edema will stay constant. Persons who have edema will stay constant. Persons who have edema of the lower lid or over the infraorbital rim should be warned that this would persist following surgery.

The lower lid should have a tangential relationship with the lower limits of the cornea. Seldom does it cover the cornea by more than 0.5 to 1 mm. The distance between the lower lid and cornea exposing the white of the sclera varies among patients, and the magnitude of this "scleral show" should be carefully noted (Fig. 31-15). If present, it should be carefully and thoroughly discussed with the patient, since one tries to avoid this look postoperatively. Scleral show may alarm the surgeon and/or patient unless carefully noted preoperatively.

Palpation of the infraorbital rim should be carried out to determine whether its presence contributes to the bagginess of the lids.

Certain conditions cannot be removed or significantly changed by blepharoplasty. After the examination, the surgeon should point out any of the following to the patient:

1. *Crow's-feet,* or laugh lines, that are lateral to the lateral canthus can rarely be improved. These are caused by activity of the orbicular muscle and can be demonstrated by having the patient squint. In the immediate postoperative period these are often diminished because of edema, but in few months they will return.

2. *Fine wrinkling* of the lower lids cannot be removed by blepharoplasty alone. Occasionally this wrinkling is accentuated by blepharoplasty. Certain adjunctive measures, such as chemical peeling, are necessary for removal or improvement of the condition.

3. *Cheek pads* cannot be completely eliminated; these are often caused by edema and fluid retention in the soft tissues anterior to the infraorbital ridge and over the zygoma. Injections of dilute corticosteroids may improve this condition.

4. *Dark circles* under the eyes will not be improved by blepharoplasty, although if shadowing is caused by fat herniation, it will be improved and the dark circles may be less noticeable.

Contraindications

Patients who have proptosis, either congenitally or caused by thyroid disease, make poor candidates for blepharoplasty. A naturally deep-set eye is a relative contraindication to

upper eyelid blepharoplasty because surgery further exaggerates the hollow look. Patients with dry eyes are poor candidates for blepharoplasty, and only very conservative surgery should be undertaken.

Although not a contraindication per se, the patient should be questioned concerning the chronic use of aspirin or aspirin-containing compounds or any medication that may affect blood coagulation. This kind of medication should be discontinued approximately 2 weeks before surgery to allow platelet aggregation to return to normal. As noted earlier, the presence of a general medical cause for eyelid edema or the presence of significant ocular pathology is usually a contraindication of blepharoplasty surgery.

Preoperative Testing

Before any surgical event, an accurate assessment of the patient's eyes and visual acuity should be undertaken. Visual acuity, extraocular muscle movement, tear film, width of palpebral fissures, and visual fields (if indicated) should be measured. These tests can be done in the surgeon's office by a nurse, trained technician, or the surgeon himself. We have found it helpful to have the patient undergo a thorough ophthalmologic examination performed by an ophthalmologist. We have found ophthalmologist colleagues in our area who will work with us in assessing patients preoperatively. We have compiled a form that the ophthalmologist completes and returns to us (Fig. 36-16). We review this report before the operation, and it becomes a part of the patient's record.

This thorough, complete ophthalmologic exam serves as a baseline, should the patient complain of any visual change postoperatively. It also alerts us to any dry-eye problems that we may need to address in the postoperative period. Most ophthalmologists are prepared to offer a much more detailed visual field examination. This may be required if a claim is to be made on behalf of the patient for functional upper lid surgery.

Consultation With Patient

Based on the careful history and physical examination, the surgeon discusses the blepharoplasty with the patient, demonstrating any abnormalities and explaining what the operation will accomplish. The surgeon should also stress what cannot be changed as well as the risks and possible complications. The patient should be told what to expect in the immediate postoperative period.

If a surgical procedure is to be scheduled, photographs are taken at the conclusion of the interview. Four views are normally taken: (1) front, eyes opened; (2) front, eyes closed; (3) front horizontal, eyes looking upward; and (4) front, with the patient smiling. This last view may demonstrate any hypertrophy of the orbicular muscle in the lower lid and certain smile lines and crow's-feet that cannot be changed by blepharoplasty. The front view with eyes looking upward is often helpful in demonstrating the fat compartments in the lower eyelids.

Surgical Procedure

The objectives of the upper eyelid surgery are to:

1. Effect a well-defined, smooth, symmetric arc of pretarsal skin between the lash line and the lid crease.

2. Reduce or eliminate the lid fold.

3. Get a well-defined, properly placed crease line.

4. Eliminate any hooding of skin laterally at the junction of the lid and the bony orbital rim.

5. Provide a pleasing medial canthal area.

6. Produce fine, unnoticeable scars.

In the lower lid the goals are to:

1. Smooth wrinkles, folds, and convexities of the lids by removing appropriate amounts of skin, muscle, and fat.

2. Prevent downward displacement of the lower lid causing scleral show or ectropion.

3. Produce fine, inconspicuous subciliary and lateral scars.

The ambulatory surgery center or properly equipped office surgical center is suitable for all forms of cosmetic surgery, including blepharoplasty.

Anesthesia

Most surgery should be done with a qualified anesthesiologist in attendance. Although adverse reactions to anesthetic are unusual, the anesthesiologist can manage any untoward reaction, arrhythmia, or airway problem. Local anesthesia is preferred for all cosmetic surgery, including blepharoplasty. The patient is given premedication preoperatively. This is generally morphine, diazepam, and atropine in appropriate doses. In the operating room just before the injection of 1% lidocaine (Xylocaine) with epinephrine 1:100.000, the patient is given an intravenous injection of diazepam followed by intravenous ketamine. A *low dose* of ketamine (25-40 mg) is used to provide a brief period of anesthesia while the local infiltration is carried out. We have found that the use of diazepam prevents the unwanted hallucinations and postoperative nightmares sometimes associated with the use of larger doses of ketamine. Patient satisfaction has been near universal. The local anesthetic agent is injected through a 27- or 30-gauge needle just under the skin in the proposed surgical field. A nerve block is not routinely performed. The initial injections are superficial to the orbital septum. If injection deep to the orbital septum is needed, it is done during the procedure, and lidocaine without epinephrine is used. Waiting an appropriate length of time for adequate vasoconstriction and anesthesia is necessary with all local anesthetics.

The important consideration is to ensure the patient comfort and a pain-free operation. Whatever technique or anesthesia is employed, the result should be consistently satisfactory and predictable.

Technique

The surgical procedure should be individually tailored to suit the specific anatomic abnormalities of the patient. Immediately before the operation, the surgeon should review the preoperative findings, photographs, and operative plan.

When the patient is brought into the operating room, he or she should assume a sitting position, and the incision lines should be marked with a surgical marking pen.

In the upper lid, the inferior aspect of the incision line should follow the natural lid crease and be approximately at the upper level of the tarsal plate. This line is usually 9 to 11 mm above the lashline. Often, a fine caliper is used to make this measurement. Laterally, the incision continues to follow a natural skin fold and may curve slightly upward toward and perhaps slightly beyond the lateral bony orbital rim (Fig. 31-17). A small forceps can be used to grasp the skin of the upper lid to assess how much skin is to be resected. Usually, this is just enough skin to cause the lid to open 1 mm or so (Fig. 31-18). The upper part of the excision is marked, and a fusiform-shaped incision is then outlined (Fig. 31-17). The inferior and superior incision lines join at a variable point above the area of the medial canthus. Laterally, it continues to follow a natural skin fold and curves slightly upward. The lateral extent is determined by the amount of redundant skin in the lateral portion of the eyelid. Care must be taken to avoid excessive skin resection in the medial aspect over the canthal area because this may lead to webbing postoperatively.

The lower eyelid incision is marked immediately below the lashline and carried laterally beyond the lateral canthus in a skin line or fold. Its exact position is determined by the type of lower eyelid procedure to be performed. The location of the lower lid fat compartments may be marked as well.

Upper eyelid

After the incision has been marked and anesthesia obtained, the incision is made sharply with a No 15 blade (Fig. 31-19, A). The skin and underlying muscle are excised as a unit (Fig. 31-19, B). Any additional soft tissue in the lateral portion of the upper lid deep to the orbicularis muscle can be excised at this time as well. A small scissor or electrosurgical knife can be used. After this is completed, the fat compartments are injected with 1% lidocaine without epinephrine. We prefer to use no anesthetics with epinephrine below the orbital septum. The use of epinephrine may cause vascular constriction and may mask bleeding that would otherwise occur during fat resection. During fat resection we prefer to be able to see and monitor all bleeding points and attend to them at the time. While this anesthetic is working, careful hemostasis is achieved by the use of electrocoagulation.

The orbital septum is then opened with the electrosurgical knife. Under direct vision the central and medial fat pads are dissected, and appropriate amounts of fat are removed. As soon as the septum is opened, the redundant fatty tissue will start to protrude, and gentle

pressure on the globe may help deliver this tissue, which is then resected (Fig. 31-20).

Over the last several years the electrosurgical knife has been used safely for the opening of the orbital septum and for dissection of the herniated orbital fat (Tobin, 1985). Wide opening of the orbital septum gives superior exposure of the fat pad and allows for accurate fat removal and meticulous hemostasis, all done under direct vision. The electrosurgical knife allows meticulous control of fat removal with virtually no tension on the fat pad. This minimizes patient discomfort and also decreases the chance of rupturing small vessels deep in the orbit. The electrosurgical knife provides clear, dry dissection with virtually no bleeding. Any bleeding can be easily spotted because of the wide exposure, and bleeding vessels can be coagulated instantly. This technique eliminates the need for stab incisions through the orbital septum that may cause trauma to the fat pad and unrecognized bleeding.

Compared with the medial compartment, the central compartment is usually larger and contains more fat that is darker. In the medial compartment the fat is ivory in color and seems to be slightly more firm. Care must be taken to find this medial compartment because the fullness caused by fat in this area is often a primary concern to the patient and his image of the aging eyes. In spite of local anesthesia the patient may feel momentarily discomfort with manipulation of the fat pads. This seems to be more evident in the medial compartment and is described as a pulling sensation. This is brief, and reassurance seems to adequately handle the problem. Excessive removal of fat in the upper eyelid will create a hollow-eye appearance, which should be avoided. After removal of the fat, careful hemostasis is again obtained.

A variety of suture material may be used to close the incision. Monofilament nylon or other nonabsorbable suture usually produces the least reaction and the finest scar, free from milia, suture marks, or tunnels. More reactive or braided suture can be used but should be removed in 48 hours. Longer-acting absorbable suture should be avoided because of the possibility of a long-term inflammatory process and the scarring that may result. A running subcuticular technique is performed (Fig. 31-21).

Lower eyelid

The surgeon must decide whether to use a skin flap or skin-muscle flap for lower eyelid procedures. Each technique has certain advantages. More than 10 years ago, studies were done to determine whether there was a significant difference between the two methods. Independent observers concluded that neither offered superior results in the routine case.

In the *skin-muscle flap* the plane between the orbital septum and orbicular muscle seems less vascular and more easily and quickly opened than with the skin flap. This flap provides ready access to the fat compartments. "Button-holing" in the skin is also less likely.

The *skin flap* seems more appropriate if the patient has a great deal of loose, crepelike, wrinkled skin. This technique allows the skin to be more easily redraped. The skin flap is the preferred method when plication or resection of the orbicular muscle is anticipated.

The lateral portion of the lower blepharoplasty incision is made with a scalpel (Fig. 31-22). A skin-muscle flap is then developed inferiorly and medially. We prefer to make the

incision below the lash line with fine, curved iris scissors. This allows the incision to be made very close to the lash line. One blade is inserted under the skin and orbicular muscle, and the external blade is superficial to the skin but under the lashes so that they are not injured (Fig. 31-23). The dissection of the flap is accomplished with blunt scissors and follows the line of the infraorbital ridge. The skin-muscle flap can then be retracted with skin hooks. A skin flap can be developed in similar fashion (Fig. 31-24).

After the flap is elevated, the fat pads of the lower lid are injected with local anesthesia without epinephrine; hemostasis is obtained with electrocoagulation. If a skin-muscle flap has been developed, the orbital septum is opened with an electrosurgical knife. With gentle pressure on the globe the redundant fatty tissue is exposed through the openings in the orbital septum and trimmed (Fig. 31-25). Again the electrosurgical knife is used, and the fat is removed under direct vision. All bleeding points are meticulously controlled. The surgeon must have a good concept of the amount of fat to be removed and from which compartment. This is accomplished by careful preoperative examination. The desired result is to bring the lower lid level with the bony orbital rim. Excessive removal of fat should be avoided because it tends to give a hollow, sunken appearance to the lower eyelid.

When all the fatty tissue has been removed, the flap is advanced superiorly and slightly laterally. How far and in which direction the flap is advanced are determined by the end result desired and the strength of the lower eyelid. Usually a triangle of skin is removed from just beneath the lateral canthus within the palpebral angle (Fig. 31-26, A). This allows for minimal tension to be exerted on the lower lid and will not bring downward tension on the eyelid itself. If a skin-muscle flap has been used, some muscle and soft tissue will be trimmed from the flap and bleeding again controlled. This part of the incision may then be closed.

The surgeon must next determine the amount of redundant skin to be removed from the lower eyelid margin. *Conservative* removal of skin is appropriate. A good rule of thumb is to remove approximately half of what appears to be the total amount of redundant skin. The maximum should not exceed 4 mm. When laying the skin edges back together, having a little excess skin is generally preferable to having the wound edges just barely touching. It may also be useful to ask the patient to look upward and open his mouth. This places maximum tension on the flap. The amount of skin may be marked and removed with a fair amount of confidence (Fig. 31-26, B).

After the skin flap has been appropriately trimmed, a thin strip of muscle below the skin flap is removed. In the patient who has hypertrophy of the palpebral portion of the orbicular muscle, more muscle tissue should be removed. The wound edges should fall together, and there should be virtually no tension on them or on the eyelid. The incision in the lower lid can be closed with nonabsorbable suture such as nylon or Prolene. We have also used fast-absorbing gut suture in the lower eyelid and found it to be quite useful. Several interrupted sutures are placed laterally and one or two sutures are placed along the incision that is below the lash line. This seems to give good approximation. The suture line is coated with antibiotic ophthalmic ointment twice a day. The mild chromic suture usually dissolves in 4 to 6 days (Figs. 31-27 to 31-29).

If the lower lid is weak or atonic, a *horizontal shortening* of the tarsal plate is preferred. The resection area should be between the lateral limbus and the lateral canthus. An incision is made through the lower lid to encompass the entire thickness of the tarsal plate (Fig. 31-30). Each edge of the cut lid is grasped with a small forceps, and the ends are pulled over each other to determine how much overlap exists (Fig. 31-31). An appropriate piece can then be removed. Often this is as much as 4 mm or more of tissue.

Reapproximation is done with one or two buried Vicryl sutures through the tarsal plate and soft tissues but not through the conjunctiva. The lid margin should be carefully reapproximated and slightly everted by horizontal mattress sutures of nonabsorbable material. Care must be taken to place these sutures in such a way that they will not irritate the cornea or conjunctiva (Fig. 31-32).

In general, men have a much weaker lower tarsal plate than do women. In every man over age 50, lid shortening should be considered. We probably perform them in 80% or more of the cases. In women of the same age we use this technique 30% to 50% of the time. In the younger age groups it is used less often. This technique adds an extra measure of safety to the procedure. If a lid shortening is carried out, a Burrows triangle may need to be removed in the lower lid skin resection. This may be done medially and/or laterally at the time of closure.

Special techniques

M-plasty. If the excision of skin of the upper lid is considerable, especially if taken medially to the punctum, employing an M-plasty with the skin removal is often useful. The M-plasty can be positioned vertically toward the nose, which prevents a webbing effect as the incision heals (Fig. 31-33).

Supratarsal fixation. One of the goals of the upper lid operation is to ensure a good lid crease, one that is well defined and does not have a lid fold hanging over it to any significant extent. The surgeon should be able to place that crease where he wishes. Ideally it should be about 10 mm from the lash line. Removal of a strip of orbicular muscle at this point will usually accomplish this goal. If the surgeon wishes extra assurance that the lid crease placement will be exact or if he is trying to create a totally new lid crease, a supratarsal fixation technique may be used. This technique is especially helpful in westernizing the Asian eye. Nonabsorbable sutures are placed through the skin edge, the inferior cut edge of the orbicular muscle, through the levator aponeurosis, and then back through the skin (Fig. 31-34). These are placed about every centimeter or so and are removable. Buried nonabsorbable suture may be used as well. These sutures are placed through the edges of the orbicular muscle and levator aponeurosis. The latter technique gives the best assurance of a well-defined lid crease and has been advocated for the Asian eye. Temporary ptosis may occur, causing the patient some concern in the early postoperative period.

Suspension techniques. Suspension techniques have been used in the lower lid that is not judged weak enough to require horizontal shortening. These techniques involve creating extra support for the lower lid by using the orbicular muscle. The muscle may be plicated by passing the suture from the muscle inferior and below the lateral canthus through the

periosteum of the medial aspect of the supraorbital rim and then tightening the suture to gain extra support for the lower lid. This creates a kind of muscle sling (Fig. 31-35). Webster et al (1979) have described a technique of passing a permanent suture through the tarsal plate just inferior to the lateral canthus to the periosteum inside and just deep to the orbital rim. The position of the suture is critical. This technique may produce a bit more swelling and inflammation, requiring a slightly longer recuperation period (Fig. 31-36).

Alternative approaches to the lower lid - transconjunctival lower lid blepharoplasty

If preoperative clinical evaluation of the lower lid demonstrates that the *only* abnormality in the lower lid is herniated orbital fat, the surgeon can consider a transconjunctival removal of this fat. This technique involves removal of lower lid fat through an incision made in the conjunctiva of the lower lid (Fig. 31-37). The advantage of this technique is that it leaves no external scar. It also preserves the integrity of the muscle sling that helps support the lower eyelid. Some have suggested that postoperative lower-lid rounding is caused by techniques that violate the integrity of this muscle (such as a standard skin muscle flap blepharoplasty). Care must be taken, however, to select patients carefully for this procedure, remembering that only herniated fat can be corrected. The technique will not address hypertrophied muscle or excess skin. In approaching this procedure, the surgeon may choose to sit at the patient's head rather than at his side. The conjunctiva can be anesthetized topically with 0.25% of tetracaine. The lower lid is retracted and infiltrated with 1% xylocaine and with epinephrine, and is then retracted caudally with a suture or small retractor (Fig. 31-38). The globe can be protected with any corneal protection device or clear retractor. The surgeon then palpates the infraorbital rim, and the incision is made a couple of millimeters above that line. The electrosurgical knife can be used to make this incision. The orbital fat compartment is immediately encountered. Gentle pressure on the globe will cause herniation of the fat through the incision line (Fig. 31-39). The fat compartments are then injected with lidocaine 1% without epinephrine as in the standard lower-lid approach. The fat is dissected from each lower lid compartment as determined by preoperative assessment (Fig. 31-40). We prefer direct dissection of the fat with the electrosurgical knife as described earlier. After the fat has been resected, the procedure is concluded. The lower lid should be stretched cephalically to release any small adhesions. The incision may be closed with one or two sutures made of fast-absorbing gut. Many surgeons prefer to leave the incision open. Either way, the incision heals well without difficulty. Some ophthalmic ointment may be placed in the cul-de-sac of the lower lid to assist healing. It has been our experience that in carefully selected patients this is an efficient way to deal with the lower eyelid.

Brow ptosis

Careful consideration must be given to the position of the brow when planning blepharoplasty. In the older age groups a combination often exists of ptosis of the brow and a redundant upper eyelid fold, which causes the aesthetic problem the patient wishes corrected. This condition should be accurately diagnosed preoperatively and discussed with the patient. If the brow is ptotic, surgery of the upper lid alone will not give a maximally satisfactory result (Fig. 31-41).

Correction of the ptotic brow may be accomplished by a direct browlift. This is done by making an incision directly above the eyebrow, resecting an appropriate amount of skin superior to the incision, and closing the incision. If the patient has a prominent horizontal forehead crease, it may be used rather than the incision right above the eyebrow itself. Both these techniques are easy to perform and control. They cause little postoperative discomfort or disability. The disadvantage of both of these techniques is the placement of the scar on the visible portion of the face. For women it is more acceptable because it can be covered with eyebrow pencil or makeup. It presents a more difficult challenge in men; however, with careful attention the scars may be completely acceptable.

Elevation of the brow may be accomplished by a forehead lift. A coronal incision is used to lift the entire forehead. This technique improves deep horizontal forehead creases and glabellar lines. The scar is placed in hairbearing tissue, which can be used to camouflage it. Any of the browlift techniques should be considered at the time of blepharoplasty.

Postoperative Care

Immediately following the surgical procedure, the patient is taken to the recovery room to be carefully monitored for the next few hours. Cool, moist compresses are applied to the eyes. These are soothing and may diminish the postoperative edema and ecchymosis. We believe that large compression dressings should be avoided, since they tend to obscure any postoperative bleeding and are generally quite uncomfortable for the patient. Recovery room personnel should be carefully trained to observe closely for any signs of rapid swelling that may indicate postoperative bleeding. Should any unusual swelling take place, the physician should be notified immediately. If hematoma is confirmed, the patient should be returned to the operating room for evacuation of and control of bleeding of the hematoma. The onset of proptosis, pain, or visual disturbance requires immediate examination and appropriate action to resolve the problem.

In our experience patients leave the ambulatory surgery center in a few hours and return home. They are able to eat normally and care for themselves in the usual way. They are often sleepy for the first 24 hours after surgery. Many prefer to continue to use the cool, moist compresses. We recommend that the patient sleep with the head slightly elevated for the first 48 hours. Our patients are given prescriptions for an analgesic and sleeping preparation, although very few use more than one or two pain pills or sleeping pills, and the majority use none at all. Patients use a sterile ophthalmic ointment commencing 24 hours after the surgical procedure. This reduces crust formation and ensures easy, painless tape removal.

The patient is seen in the office 3 or 4 days after surgery, at which time the sutures are removed. After 1 week the patient may wash the eyes normally, apply makeup, and follow normal personal routines.

Complications

Careful preoperative evaluation and adherence to safe, sound surgical technique will help to maximize the favorable results and minimize complications. A variety of temporary sequelae may occur in the postoperative period, which will resolve over time. Occasionally

true complications occur even in the patients of the most experienced and skillful surgeon. Although serious complications are uncommon, it is imperative that the surgeon be totally familiar with the management of all potential problems. These events may be subdivided temporally into (1) those that occur in the immediate postoperative period, (2) those that occur in the first 2 weeks postoperatively, and (3) those that occur later than 2 weeks following surgery.

Immediate postoperative period

Hematomas and *swelling of the orbit* may occur in the immediate postoperative period despite meticulous hemostasis during this procedure. Often the onset of bleeding is related to coughing spasms, retching, or vomiting postoperatively. With hematoma or swelling in the orbit the risk of vision loss increases dramatically from compression of the optic nerve and the vascular supply to the nerve and the globe. Hematoma without any signs of change or diminution in vision is best treated by returning the patient to the operating room, opening the incision, evacuating the clots, and controlling the bleeding.

If any loss of vision occurs, heroic measures must be instituted. These include the above-mentioned procedures as well as intravenous injection of mannitol and steroids, which may help decrease ocular pressure. If this does not relieve the pressure, a lateral canthotomy and lysis of the canthal tendon should be performed. If this is insufficient to relieve the edema and pressure, bony decompression of the orbit should be performed. Such treatment is rarely needed, but the surgeon should be prepared to do whatever is necessary to protect the patient's vision. Emergency consultation with an ophthalmologist is appropriate.

Blindness after blepharoplasty is an exceedingly rare occurrence. It is certainly one of the most feared complications. Fifty-eight cases have been reported; the incidence is approximately 0.4% or 1 in 2500 operations. Exhaustive investigations have failed to reveal a single explanation for vision loss after blepharoplasty, although this complication has never been reported in the absence of periorbital fat removal.

Blepharoplasty rarely causes much pain, therefore severe pain in the postoperative period is a cause for concern because it may indicate a developing orbital hematoma, a corneal abrasion, or an attack of angle-closure glaucoma. If severe pain develops, these diagnoses should be ruled out.

First 2 weeks after blepharoplasty

A variety of minor problems may occur in the 2 weeks after blepharoplasty. These are most always temporary and usually resolve without serious sequelae. Nearly all patients experience *eyelid swelling* and *ecchymosis* that will resolve over the first week or so. Occasionally patients will experience ecchymosis in the lower lid that lasts longer. *Subconjunctival hemorrhage* usually persists. *Tearing* and a *burning* sensation may be noticed in the first week or two after blepharoplasty. The use of artificial tears before retiring and taping the eyes closed at bedtime may be advisable if the symptoms are severe. Most patients report some difficulty with contact lens use immediately after surgery. Some women report *diminished sensitivity* of the upper lids when applying makeup. Full sensation nearly always returns. Patients may report discomfort in the lower lid areas if suspension sutures have been

used.

A small amount of lagophthalmos or ptosis in the early postoperative period is not unusual. This generally resolves as the swelling of the upper lids diminishes. If this persists, the patient will complain of a foreign body sensation; he may be prone to corneal abrasion as well. Lubricants during the day and at night should be part of the therapy for these patients, and the eyes should be taped closed at night. Severe lagophthalmos may require removal of scar tissue and skin grafting to the upper lid. Mild cases are best managed conservatively by massage, time, and reassurance.

Over the next several weeks the patients will notice that the incision lines will be somewhat red and have occasional lumps and bumps which may be slightly tender. These irregularities usually correspond to the sites of electrocoagulation and they almost always subside totally. If there is prolongation of these indurated areas or widening or thickening of the scars, a solution of triamcinolone (10 mg/10 mL) may be injected to facilitate resolution.

Late complications

Most of the later complications are related to problems of lid position, scar formation, or unresolved aesthetic problems.

Minimal *scleral show* may be noticeable after skin or muscle excision of the lower lid. Some surgeons will not mention this unless the patient raises the subject. Often this will improve with time; massage may speed its resolution. Moderate scleral show may be the patient's major focus of concern. As long as the lower lid margin is in contact with the globe, one may elect a conservative course of massage and reassurance. If after several months the situation has not improved significantly or the patient is still dissatisfied, an additional procedure such as muscle suspension or lid shortening may be required.

Ectropion occurs when the lid margin is rotated inferiorly with separation from the globe; this condition is a serious complication (Figs. 31-42 and 31-43). It will almost always require further surgical intervention, such as horizontal lid shortening, muscle suspension, or skin grafting.

Occasionally *scars* may present a problem. Keloids in eyelid surgery are unusual, even in patients who form keloid elsewhere. Problems will be minimized if the incisions are not carried laterally to the lateral orbital rim. Occasionally scars will web, especially those in the medial portion of the upper lid. This may require a Z-plasty at a later date. Suture tunnels and milia may be simply treated by evacuation of the contents with a needle or No 11 blade.

Occasionally persistence of some aesthetic problem concerns the patient. Persistent *fat hernias* indicate either insufficient removal or inattention to specific compartments during the operation. These hernias may be removed after several months at a second operation. *Redundant skin* may exist in the upper lid, or an insufficient amount of soft tissue and muscle may have been removed. A prominent *orbicular ridge* beneath the lower lid may also be present. Most of these conditions result from errors in surgical judgment and may be corrected at later operations.

Revision Blepharoplasty

It should not be necessary to repeat a well-done blepharoplasty. The patient who returns 7 to 10 years after initial surgery complaining of excess skin in the upper lids usually has ptosis of the brow. As the brow drops, the skin of the upper lid becomes redundant. This issue must be addressed if any further surgery is considered.

Revision surgery should be approached very cautiously. Usually the initial operating surgeon removed sufficient amounts of skin, and only very rarely should additional skin be removed from either the upper or lower lids. If persistent, fat herniation or hypertrophied muscle is present, the operation should be designed to improve these situations. Overzealous removal of skin at secondary operation will lead to lagophthalmos and ectropion, which are serious problems.