BLEPHAROPLASTY - REPAIR AND REJUVENATION

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ABSTRACT

<u>Background</u>

Surgical treatment of the eyelids and periorbital regions is an essential part of aesthetic facial surgery. The aging process produces predictable changes in these structures. As blepharoplasty is currently performed, each of these individual components is addressed based upon evolving anatomical knowledge.

<u>Objective</u>

To present a detailed review of upper and lower blepharoplasty, adjunctive periorbital surgery and complications. The aesthetic surgeon should gain better understanding of these procedures.

<u>Conclusion</u>

Blepharoplasty is a procedure that can be mastered by cosmetic surgeons based upon an understanding of anatomy, age-related changes and surgical options. A critical "eye" is required for patient assessment. Acquisition of requisite surgical skills is paramount. The astute surgeon will keep abreast of new developments in the field.

BLEPHAROPLASTY - REPAIR AND REJUVENATION

Blepharoplasty can be one of the most rewarding cosmetic surgical procedures. The eyes and periorbital region play an essential role in beauty and are a not so subtle clue to age. While many consider upper eyelid blepharoplasty in particular to be a "skin only" procedure, a more complete understanding of the periorbital complex and which surgical procedures are appropriate for specific problems is necessary. This article will address the basic concepts of upper and lower eyelid blepharoplasty, complications and how to avoid them.

PREOPERATIVE EVALUATION AND EXAMINATION

Obtaining a complete medical history is one means to avoid operative and postoperative complications. Blood thinners, including herbal products, should be discontinued preoperatively. Antihypertensives should be continued for patients with hypertension. Any history of Grave's disease should be elicited. These patients may demonstrate globe proptosis, upper and lower eyelid retraction as well as prolapsed orbital fat pads and lacrimal glands. Patients with myasthenia gravis may show lid ptosis.

Any history of dry eyes should be documented preoperatively. Dry eyes may occur secondary to Sjogren's syndrome as well as secondary to medications such as antihistamines, anticholinergies and oral retinoids. The etiology of dryness is often idiopathic and is commonly subclinical, especially in middle aged patients. Eyelid surgery can make these subclinical patients symptomatic. The presence of dry eyes can be documented preoperatively by the Schirmer's test. Proparacaine drops are instilled into the eyes initially. After five minutes, 10 - 15 mm of wetting on the paper documents normal basal tear production. Less than 10 mm is indicative of dry eyes, which has implications for surgical approaches. At least one recognized expert does not routinely perform the Schirmer's test stating that it is "not adequately sensitive or specific.[1]

Knowledge of what constitutes normal periorbital appearance is paramount if problems are to be recognized and repaired. Beginning superiorly, the brow position and shape must be addressed. Traditionally, the ideal female brow is located just superior to the orbital rim and arched with its highest point in the area of the lateral limbus. The ideal male brow is located just below the orbital rim and tends to be straighter. Such strict definitions of ideal beauty are no long applicable and many variations, particularly in female anatomy, are not only considered acceptable but desirable. Any brow asymmetry should be documented. The upper eyelid margin should rest 1.5 - 2 mm below the superior margin of the limbus. Significant ptosis of the upper lid should be documented but, again, revision is a personal decision and some patients may consider a certain degree of ptosis "sexy". The lateral canthus is located approximately 2 mm superior to the medial canthus in males and approximately 4 mm superior to the medial canthus in females.

The upper eyelid crease in males is located 6 - 8 mm superior to the eyelid margin, and 8 - 10 mm in females. In Asians, this crease is highly variable and may be nonexistent. A higher than

normal eyelid crease, especially with a deep superior sulcus, may be due to dehiscence of the levator aponeurosis. Levator function is typically normal in this scenario and can be assessed by having the patient look downward then upward. The excursion of the upper eyelid margins should be 12 - 16 mm. Any degree of lid ptosis should be addressed preoperatively with the patient.

Dermatochalasis represents excessive skin of the upper eyelids and is the primary reason for upper eyelid blepharoplasty. The term dermatochalasis is sometimes confused with the term blepharochalasis, a condition that typically occurs in young patients and as characterized by lymphedema of the upper eyelids, lid ptosis and lacrimal gland prolapse. In the preoperative visit, the patient should be made aware of lacrimal gland prolapse if present. This is characterized by fullness of the lateral aspect of the upper eyelid. Fullness centrally or medially is caused by prominence of one or both of the underlying fat pads.

Evaluation of the lower eyelid should begin with assessment of the location of the eyelid margins relative to the globe. The lower eyelid margin should touch the limbus or approach it closely. Scleral show is characterized by the presence of an excessive distance between the limbus and the lower eyelid. It can be caused by the cicatrization of the anterior or posterior lamellae or by lid laxity. To check for lid laxity, a snap test should be performed. The lid is grasped between the thumb and index finger and gently pulled away from the globe. Upon release, a functionally adequate lower eyelid will snap back to its normal position immediately. Failure to snap back quickly will need to be addressed surgically. Lid laxity may be attributable to degenerative changes in the tarsal plate or in the medial or lateral canthal structures. Large globes are more prone to scleral show, both preoperatively and postoperatively. Efforts to tighten the lower lids in

such patients can worsen the problem as the lid margins tend to slide down even farther over the globe. Laser skin resurfacing in such patients is fraught with the same complication. The cautious surgeon will remember the admonition, "Big eyes, big trouble" (Figure 1). Steatoblepharon is caused by prolapse of one or more of the three lower eyelid fat pads. Upward gaze will make these fat pads more obvious allowing the surgeon to determine the relative contribution of each pad. Treatment of these fat pads will depend on other aspects of facial anatomy, principally the prominence of the infraorbital maxilla. The concept of vectors is helpful in this respect. In the sagittal plane, the anterior-most portion of the globe projects beyond the inferior orbital rim in patients with a negative vector (Figure 2). These patients often have hypoplastic maxillae, preoperative scleral show and tear trough deformities. This anatomy is often worsened by lower eyelid fat removal. Fat repositioning or filler agents can result in excellent results in such patients. If the projection of the globe and inferior orbital rim coincide, the patient has a neutral vector and may be a candidate for fat repositioning. Finally, patients with a positive vector, in which the inferior orbital rim projects beyond the globe, do well with simple fat pad excision alone.

Figure 1. Big eyes, big trouble - This patient is at risk for lower blepharoplasty-associated complications.
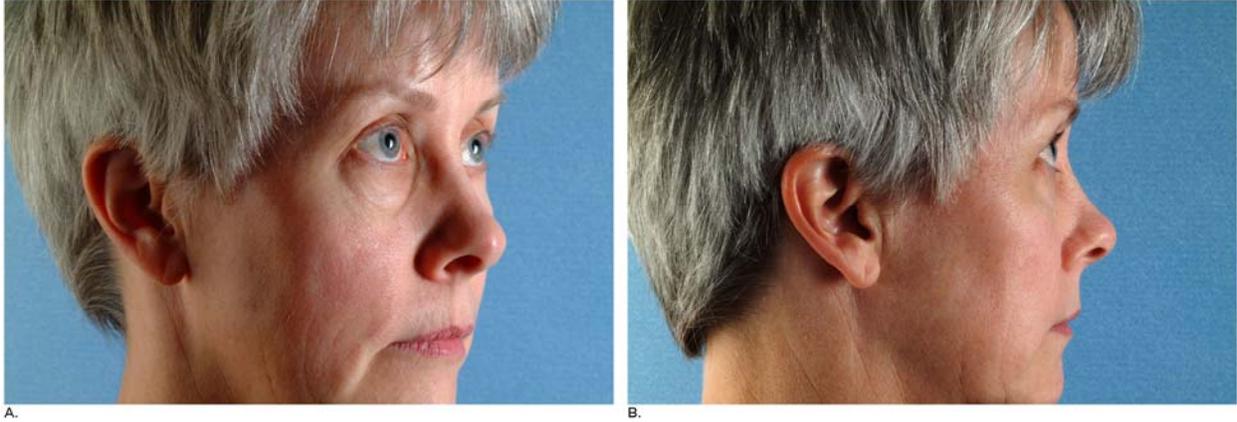
Figure 2. Negative vector. This patient demonstrates a hypoplastic maxilla.
The most anterior portion of the globe extends beyond the orbital rim.
A. Right oblique view; B. Right lateral view.

The last important aspect of the preoperative evaluation is documentation of visual acuity. The author does not routinely perform testing if the patient has had an eye exam within the past twelve months. A Snellen Chart or a hand held visual screening chart may be used if desired.

UPPER EYELID BLEPHAROPLASTY

Surgical patients should be appropriately draped and anesthetized with local anesthesia. Hyaluronidase may be added to the anesthetic as a spreading agent to reduce the number of needle punctures and amount of bruising. If the anesthetic spreads too far, however, levator function can be altered resulting in postoperative eyelid ptosis. Oral, intramuscular, or intravenous sedation is provided at the discretion of the surgeon. The globes of the eyes should be protected by corneal shields. Blood pressure control is essential and should be monitored preoperatively, intraoperatively and postoperatively. Unanticipated hypertension may be treated with clonidine 0.1 mg orally. The dosage can be repeated after 30 minutes if necessary. To avoid nausea, vomiting and Valsalva maneuvers, ondansetron 4 mg or 8 mg in an orally disintegrating tablet can be administered preoperatively or postoperatively.

Precise preoperative marking of the planned excision is crucial. Perfect surgical technique is pointless if the incisions are misplaced. The first step in upper eyelid blepharoplasty is to establish the eyelid crease. The incision to create the eyelid crease should stay superior to the tarsal plate and extend no deeper than through orbicularis muscle to avoid levator dehiscence. At least 1 cm of skin should be left between the upper incision and the eyebrow. No more then 1/3 of the upper eyelid skin should ever be removed and at least 2 cm of anterior lamella is necessary for normal functioning and to prevent lagophthalmos. To test the proposed amount of skin to be resected, the skin can be gathered along the proposed incision lines with forceps. This should make the upper lid taught or may very slightly elevate the lid margin. Excision can be performed with a CO2 laser in continuous wave mode, a scalpel, an electrocautery or a radiofrequency device. The excision may contain skin only or skin plus orbicularis muscle. In patients with dry eyes, excision of skin only preserves the innervation of the orbicularis muscle, the dynamics of eyelid closure, tear pumping and tear distribution.2 Heavy eyelids may require excision of muscle but overresection of muscle can feminize the upper eyelid in males. Even when a skin-muscle flap excision is planned, it is sometimes advisable to remove skin only over the lateral palpebral vessels. These vessels tend to bleed and are located laterally over the orbicularis muscle. To prevent epicanthal webbing, the medial aspect of the incision should be angled upwards at the medial canthus.

If better definition of the eyelid crease is desired, supratarsal fixation can be performed. A bit of levator aponeurosis is picked up in the skin to skin closure thereby establishing the lid crease at that position. Supratarsal fixation may be helpful to correct lid crease asymmetry although it is not always necessary. Removal of a strip of orbicularis muscle at the desired crease location will

cause the crease to fixate spontaneously. In patients with large eyes, supratarsal fixation may

cause too much attention to the eyes. If present, eyelid ptosis can be repaired at the same time as

upper eyelid blepharoplasty by approximating the levator aponeurosis to the tarsal plate in cases

of levator aponeurosis dehiscence[.3,]4 An alternative approach is that of Müllers muscle-

conjunctival resection[.5]

Following upper eyelid skin and/or muscle excision, the two fat pads of the upper eyelid may be

addressed. These fat pads are not typically removed in men unless extremely prominent because

concavity of the upper eyelids feminizes the eyes. The orbital septum is a whitish membrane,

clearly visible to the surgeon beneath the orbicularis muscle. It should be incised medially and

superiorly. A medial incision ensures that the lacrimal gland will not be violated. Superior

placement will avoid the levator aponeurosis. If the levator aponeurosis should be inadvertently

divided, it should be approximated immediately with 6-0 silk sutures. Although some surgeons

will close the septum, most do not. An alternative to incising the septum is to tighten it and even

liquify underlying fat with a CO_2 laser in continuous wave, defocused mode, or with an

electrocautery device[.6,]7 This is somewhat controversial as it is possible that thermal damage

from this procedure may lead to cicatrization.

Once the septum is incised, the central fad pad can be visualized and partially resected (Figure

3). The medial pad is more difficult to visualize, located more deeply at the medical canthus.

The inferior trochlear artery runs over the surface of the medial fat pads. It is part of the

palpebral arcade and joins the terminal branches of the facial artery. As the medial fat pad is

delivered from its origin, it is important to obtain adequate hemostasis of this vessel because once the fat pad retracts, hemostasis may be difficult to achieve.

Figure 3. Mobilization of central fat pad.

In a patient with brow ptosis and in lieu of a brow lift, a browpexy may be performed through the upper lid incision at this time (Figure 4). Following dissection over the brow, the dermis is anchored to periosteum. Although browpexy cannot achieve significant brow elevation, it can anchor the brow to prevent further descent. The upper eyelid excision is closed skin to skin unless supratarsal fixation is performed. The orbicularis muscle is very vascular and by avoiding it in the skin-to-skin closure, bleeding is minimized. It is important not to inadvertently pick up orbicularis muscle, septum, or levator muscle during closure in order to avoid tethering and lid retraction.

Figure 4. Upper eyelid blepharoplasty and browpexy.
(A.) Preoperative. (B.) Post-operative. Note location of browpexy suture over lateral brow showing slight dimpling.

LOWER EYELID BLEPHAROPLASTY

Lower eyelid blepharoplasty is performed in an effort to diminish steatoblepharon, tighten the lower eyelids if necessary and improve laxity of lower eyelid skin. Surgical preparation is similar to that of upper eyelid blepharoplasty. The infraciliary or transcutaneous approach begins with an excision through skin and orbicularis muscle within 1 - 2 mm of the eyelashes. The fat pads, identified in their postseptal position following dissection of a skin-muscle flap, can be partially resected as indicated. Septorrhaphy, in which fat is retained by suturing the septum or lower eyelid retractors directly to the arcus marginalis is another option. The infraciliary approach has the advantage of removing excessive lower eyelid skin directly. Excess skin may be excised at the level of the infraciliary incision or via the pinch technique in which excess lower eyelid skin is gathered and crushed with a hemostat prior to excision and closure[8,9] Unfortunately, because the infraciliary approach often leads to rounding of the lateral canthal angle secondary to

cicatrization and retraction of the septum, a transconjunctival approach is preferred by most surgeons today.[10]

Transconjunctival lower eyelid blepharoplasty begins with administration of local anesthesia through the palpebral conjunctiva (Figure 5). Exposure of the lower eyelid conjunctiva can be accomplished by reflecting the lower eyelid downward with a desMarres retractor or skin hook. The globe is protected by a corneal shield and/or Jaeger plate. Alternatively, the portion of the conjunctiva inferior to the conjunctival incision can be reflected superiorly back over the globe and held in place with sutures taped to the forehead. The distance between the eyelid margin and the inferior fornix is 9 - 10 mm. The incision is placed midway between the inferior tarsal border and the inferior fornix, 3 - 5 mm below the tarsal plate, leaving the septum and anterior lamella undisturbed. The laser beam or incision is directed towards the orbital rim but the septal attachment to the orbital rim should not be violated. The incision should be continuous from at least 4 mm beneath the punctum to within 2 mm of the lateral canthus. The central fat pad is mobilized and partially removed first. This allows easier visualization of the medial and lateral fat pads assuming normal anatomy. It is important to avoid damage to the inferior oblique muscle, which lies between the central and medial fat pads and posterior to the orbital rim. Local anesthesia inadvertently delivered to the inferior oblique muscle or to parasympathetic nerve fibers inferior to it can cause temporary postoperative diplopia and pupillary dilation.[11]

Figure 5. Transconjunctival injection of anesthetic.

The medial fat pad is next addressed. As in the upper lids, it is whitish in color and is more difficult to expose. It also contains blood vessels, not on top of the fat pad, but within the fat pad itself that tend to bleed. Again, hemostasis is necessary before the remaining portion of the fat pad can be allowed to retract to its initial position. Fascial attachments from Lockwood's ligament to the inferior oblique muscle form the arcuate expansion, which separates the central and lateral fat pads. The anterior extension of the arcuate expansion is characterized by thin fibrous septae. Resection of these septae can help provide greater exposure of the central and lateral fat pads. Once the appropriate amount of fat is removed from each pad, the incision is reapproximated. Sutures are not necessary.

Loeb and others have described a technique of fat repositioning intended to smooth the transition from eyelid to cheek without iatrogenic hollowing of the lower eyelid region.[12,13,14,15] Instead of removing fat, which may cause a hollow appearance of the lower eyelids in predisposed patients

(Figure 6), the medial and central fat pads can be redirected downward to fill the tear trough depression. Following careful dissection of the medial and central fat pads, they are then mobilized over the infraorbital maxilla into either a subperiosteal or a supraperiosteal (suborbicularis) pocket. Subperiosteal placement requires release of the arcus marginalis (Figure 7). The pocket needs to be large enough, up to 2 cm x 2 cm, to accomodate the fat pads but the larger the pocket, the greater the risk for denervation of the orbicularis muscle[14] Nasal ligaments and the insertion of the levator alaquae nasi muscle may need to be released. Care must be taken not to damage the infraorbital neurovascular bundle. The fat must be freed from the lower eyelid motility system with care not to damage the inferior oblique muscle or other aspects of the eyelid motility system. Temporary percutaneous sutures hold the fat in place. Postoperative swelling is to be expected, as is reduced motility of the lower eyelids for approximately six weeks. Failure to adequately free the fat from the motility system can result in permanent functional impairment. Because the septum is violated inferiorly to allow passage of the fat pads, there is a greater chance of lower eyelid retraction. Ideal candidates for fat repositioning are those with a negative or neutral vector.

Figure 6. This patient is quite please with the result of upper and lower blepharoplasty and laser resurfacing. Could her results have been better? Note the hollowing of the infraorbital areas. This could have been improved with fat repositioning. It can still be treated with injections or fat.
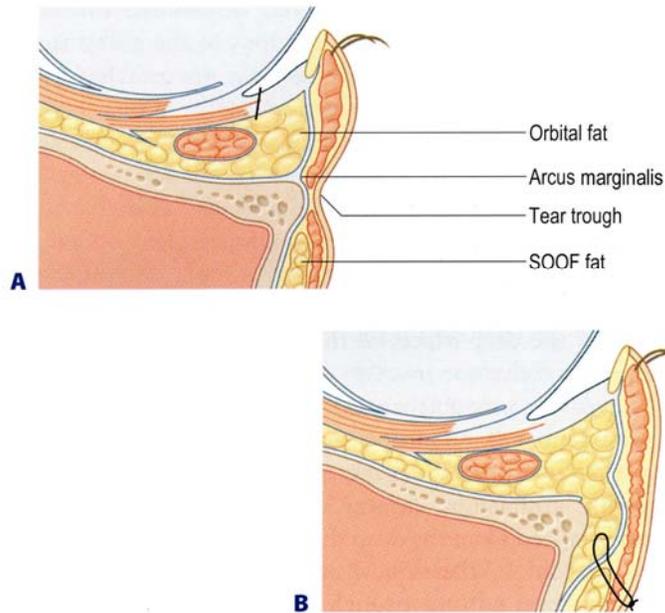(A.) Preoperative view. (B.) Post-operative view. Upper eyelid ptosis was not addressed.

Figure 7. Fat repositioning. (A.) Preoperative view. (B.) Post-operative view following release of the arcus marginalis with fat mobilized into a subperiosteal pocket and held in place by a percutaneous suture.
(Plast Reconstr Surg 2000; 105(2):743-748, with permission of Lippincott, Williams and Wilkins.)

Some patients (and surgeons) may not be comfortable with the more prolonged healing course or complications of fat repositioning.[13] Despite a negative vector, excellent results can sometimes be achieved with fat removal and laser resurfacing alone (Figure 8). Other than steatoblepharon, these patients are usually structurally intact without attenuation of supporting elements. These patients should understand preoperatively that postoperative hollowness can be addressed with filler agents or fat if desired.

Figure 8. Steatoblepharon treated with fat removal and laser resurfacing only in a patient with a negative vector / hypoplastic maxillae (A.) Preoperative oblique view. (B.) Post-operative oblique view.

Another option to the technique of fat repositioning described above is selective release of the protion of the orbicularis retaining ligament corresponding to the tear trough.[14] This allows caudal portions of the fat pads to coalesce with cheek fat. Again, placement of filler agents or fat along the maxilla will further smooth the eyelid-cheek transition.

Once the fat pads of the lower eyelid have been adequately dealt with, attention should be directed to the structural integrity of the lower eyelid itself. Laxity of the lower eyelid or lateral canthal complex can be treated via several suspension techniques.[7,16,17,1]8 Flowers believes that canthopexy should be a routine addition to all lower eyelid blepharoplasties.[19] For patients with mild to moderate laxity, ectropion, or incipient post-laser resurfacing ectropion, a canthopexy can be performed by placing a Webster stitch.[1]7 This is a permanent suture which plicates the inferior limb of the lateral canthal tendon to the periosteum inside the orbit. The lid can be tightened and the lateral canthus elevated with this technique. The author uses a 4-0 polyester fiber (Mersilene) suture on a half circle (S-2) needle. The half circle needle makes it easier to obtain an adequate purchase of periosteum.

More extensive ectropion can be addressed with a tarsal strip procedure.[1]6 Following placement of an 8 - 10 mm incision through skin and muscle; a lateral canthotomy is performed via horizontal severance of the main body of the lateral canthal tendon. The inferior crus is then

severed to mobilize it and a strip of tarsal plate is exposed by removal of overlying skin and orbicularis muscle. The tarsal strip can vary in length from 6 mm - 12 mm depending on the degree of lower eyelid laxity. The tarsal strip is then sutured to periosteum inside the orbital rim.

Following transconjunctival lower lid blepharoplasty, lower eyelid rhytides may actually appear more prominent as the fat pads, which previously stretched the skin, thereby dimishing rhytides, are no longer present[15] This is most commonly addressed with laser skin resurfacing. Although the results of this procedure are truly remarkable, care must be taken not to treat the skin too aggressively to avoid ectropion. This is particularly true for patients with previous infraciliary blepharoplasty and for patients with large globes and/or negative vectors. If laser resurfacing is not an option, a chemical peel or pinch excision may be performed. Treatment of festoons requires realistic expectations. CO_2 laser resurfacing at settings that deliver tissue contraction is helpful. Definitive treatment may require resuspension of the orbicularis muscle[20]

COMPLICATIONS

Careful attention to periorbital anatomy and a conservative surgical approach will minimize complications. Complications of upper eyelid blepharoplasty include over-resection of skin, strabismus/diplopia[21] eyelid crease malposition, infection, milia, corneal abrasion and asymmetry. Suture tracks can be minimized by good surgical technique and timely suture removal. Polypropylene (Prolene) or polybutester (Novafil) sutures are less likely to leave suture tracks than silk. Postoperative canthal webbing can be corrected by Z-plasty.

Ptosis is common for the first one to two weeks following upper eyelid blepharoplasty. Ptosis

secondary to damage of the levator aponeurosis should be followed. If spontaneous correction does not occur after two to three months, surgical intervention is indicated. Ptosis may also result from supratarsal fixation placed too high, which limits excursion of the levator muscle. Lagophthalmos is the inability to close the eyes and is secondary to upper lid pathology. Minimal lagophthalmos is common posteroperatively and will resolve spontaneously. Persistent lagophthalmos is usually due to over-resection of the upper eyelid skin or a vertically shortened orbital septum due to inadvertent inclusion of the septum into the skin closure.

Dry eyes represent another complication. Although blepharoplasty does nothing to disturb tear film production, weakness of the orbicularis muscle of the upper eyelid can interfere with distribution of tear film, resulting in dry eyes. Lagophthalmos can cause dry eyes as well.

Lower eyelid complications include over-resection or under-resection of fat, strabismus/diplopia [10,22,23] ectropion (outward turning of the eyelid margins), entropion (inward turning of the eyelid margins), scleral show (retraction of the lower eyelid with good apposition to the globe) and dry eyes. Chemosis represents edema of the bulbar and palpebral conjunctiva. The etiology is unclear although placing transconjunctival incisions too close to the globe may play a role. Chemosis resolves without treatment after two to four months.

The most dreaded complication of blepharoplasty is periorbital hemorrhage.[24] A retrobulbar hematoma is a medical emergency with may cause optic nerve compression and central artery occlusion followed by retinal ischemia. Once this emergency develops, irreparable damage will occur within 90 minutes unless the orbit can be decompressed. All sutures should be removed,

the lateral canthal tendon should be lysed and any bleeding vessels coagulated. Blood pressure control is essential. A discrete hematoma is usually not seen, as orbital hemorrhage tends to incorporate itself into orbital soft tissue. Most instances of excessive bleeding are attributable to bleeding from the orbicularis muscle or bleeding from vessels coursing through fat pads. Bleeding from the fat pads may go unnoticed if the fat pad retracts after partial removal.

CONCLUSION

The procedures necessary for basic blepharoplasty have been presented. Armed with this knowledge and observational experience in an operating room, surgeons can begin to provide this rewarding service to their patients. Like so many surgical procedures, the requisite knowledge base for blepharoplasty has evolved from multiple disciplines including plastic, oculoplastic, facial plastic, and dermatologic surgery. It is imperative that surgeons know their limits and proceed cautiously. Complicated procedures such as ptosis repair should be left to oculoplastic surgeons or others until extensive experience has gained. As the field of cosmetic surgery progresses, new insights will emerge which will require mastery. It is both a pleasure and an obligation to provide our patients with the best of care, based upon the acquisition of new concepts.

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