

# Preoperative Assessment of the Eye and Periocular Region

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## ABSTRACT

Proper preoperative assessment of the eye and periocular region is essential to verify ocular health and vision and to obtain an optimal surgical result. A systematic approach to reviewing the ocular history, review of systems, and pertinent physical exam will be discussed. This is important to identify not only underlying ocular conditions but also potentially serious systemic conditions with ocular manifestations that can impact the patient's overall health. A thorough exam by a qualified provider is needed if there are any management issues regarding the presence of a condition(s) that can impact the surgical outcome.

**KEYWORDS:** Preop, preoperative, eye, plastic, ophthalmic, vision safety, medical, periocular, eyelids, orbit, periorbital surgery, ocular

Obtaining a clear understanding of each patient's unique ophthalmic situation, which requires a thorough review of the relevant medical history and a systematic assessment of the essential anatomy, is essential to achieving success in periocular aesthetic surgery. Proper diagnosis, surgical indications, and potentially complicating conditions can be recognized and addressed through a methodical approach. This includes the surgeon's assessment and prioritization of correctable defects; a complete ocular and periocular exam; a complete history of previous surgeries, medication, and over-the-counter supplements, and systemic conditions; and a thorough discussion of the expectations, limitations, recovery process, and risks.

## REVIEW OF SYSTEMS AND OCULAR HISTORY

As a part of the review of systems, it is important to include a detailed review of ocular history. Surgery on

the eyelids and periocular region can have profound benefit to a patient's ocular health and vision, but not identifying key conditions and issues can lead to serious visual consequences. Also, problems not identified before surgery may be blamed as a surgical complication. Table 1 shows key elements to cover during a review of ocular history and potential problems.

Dry eyes can manifest with a myriad of symptoms and findings. Patients will often complain of the classic dry, red, and irritated eyes. Many cosmetic patients, who have had LASIK refractive surgery, have worsened dry eye problems. However, some dry eye patients have excessive tearing as a reflexive response to poor tear quality. Other symptoms facial surgeons should be aware of include sharp, shooting eye pain; transient visual blurring; glare; light sensitivity; eyelid crusting or recurrent mucoïd discharge; foreign body sensation; contact lens intolerance; eye fatigue and tiredness. Management of dry eye patients can be quite complicated depending upon the tear film component(s) that is (are) deficient,

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**Table 1 Review of Ocular History**

Symptom/Condition	Potential Problem(s)
Blurred vision or other visual disturbances	Dry eyes, tear film problems, corneal exposure/scarring risks
Burning/pain	Dry eyes, tear film problems, corneal exposure problems, eyelid or orbital disease
Chronic eye or eyelid infection	Postoperative wound infection risk
Dryness	Corneal exposure/scarring risks
Excessive tearing	Reflexive tearing secondary to underlying tear film deficiencies
Flashing lights/floaters	Retinal disease
Fluctuating visual acuity	Dry eyes, tear film problems
Foreign body sensation	Dry eyes, tear film problems
Glare/light sensitivity	Dry eyes, tear film problems, corneal scarring
Itching	Ocular allergies
Loss of vision	Retinal, macular, optic nerve or visual pathway disease
Loss of side vision	Retinal, macular, optic nerve or visual pathway disease
Mucous discharge, matting	Blepharitis, dry eyes, chronic conjunctivitis
Redness	Blepharitis, dry eyes, orbital or other eyelid disease, chronic conjunctivitis
Stye/chalazion	Infection risk, tear film problems from meibomian oil gland dysfunction
Tired/fatigued eyes	Dry eyes, refractive disorder, eyelid abnormalities
Double vision	Cranial nerve disorder, strabismus
Problems closing eyes	7th nerve weakness, injury; postoperative corneal exposure risks
Problems opening eyes	Blepharospasm, hemifacial spasm; 3rd nerve weakness; blepharoptosis
Glaucoma	Need to continue glaucoma medications, risk of elevating pressures if antibiotic/steroid combinations used postoperatively, risk of visual loss from postoperative swelling in advanced glaucoma patients, risk of injury or failure of filtering bleb if history of filtration surgery
Cataracts	Diminished vision, risk of injury to corneal/scleral wound if within 6 wk of surgery, risk of refraction instability for 4–8 wk if eyelid tightening procedures performed
Corneal disease or surgery	Diminished corneal sensation increases keratopathy risk, corneal graft failure overexposure
Refractive surgery	Refraction changes can occur following eyelid surgery

and these patients can suffer severe discomfort and visual compromise if this is not recognized and properly managed before the eyelids and eyebrows undergo elevating procedures. For example, prior to or during ptosis repair, one may need to address lax, sagging lower eyelids to diminish the amount of postoperative lagophthalmos, which may be quite symptomatic in the presence of very dry eyes. Visual loss can develop from severe exposure keratopathy, thinning, scarring, and even perforation if not properly managed. Therefore, patients should be asked if they use any prescription or over-the-counter eye drops or ointments. It can be assumed that patients using frequent drops or ointment (e.g., four to six times or more daily) have severe dry eyes. Restasis<sup>®</sup> (Allergan, Irvine, CA) (cyclosporine ophthalmic emulsion) is a cyclosporine derivative ophthalmic drop for patients with severe dry eye syndrome. Punctal occlusion should be considered before, during, or after eyelid surgery for patients with dry eye syndrome.

All physicians have encountered hypertensive patients who do not think they have hypertension because they take medicine for it, and so they do not disclose or

think it is a problem. In the same way, many dry eye sufferers will not admit to the problem because they feel their use of “eye drops” takes care of it. Therefore patients need to be thoroughly questioned regarding the use of any prescribed or nonprescribed ophthalmic eye drops. If there is any question of the presence of dry eyes, then basal tear production should be tested by placing an anesthetic eye drop and using a Schirmer’s test strip, looking for ~10 mm of basal tear production. Traditional Schirmer’s testing, without topical anesthetic, has not been found to be a reliable test for dry eyes.

Patients who regularly take ophthalmic decongestants (e.g., Visine<sup>®</sup> [Johnson & Johnson, New Brunswick, NJ]; Naphcon-A<sup>®</sup> [Alcon, Inc., Fort Worth, TX]) may have a serious but unrecognized underlying condition, such as thyroid eye disease, superior limbic keratitis, pterygium, dry eye, ocular allergies, and even orbital pathology. Most ophthalmologists rarely recommend ocular decongestants as they generally only mask a problem rather than offer any treatment. Chronic use can contribute to ongoing signs and symptoms and discontinuation can cause rebound hyperemia. Patients need to

explain why they use these drops and if they have had an evaluation by a qualified physician.

Glaucoma medications can cause the eyes to be chronically hyperemic. Advanced glaucoma patients cannot tolerate significant elevations of eye pressure, which can result from postoperative oral or topical steroid agents as well as increased pressure from orbital or periorbital swelling. Furthermore, advanced glaucoma patients should not stop their medications at or after surgery, as this risks further visual loss. In general the more glaucoma medications a patient uses, the more advanced the disease and the greater the risk for vision loss. Alpha-agonists (e.g., Alphagan<sup>®</sup> [Allergan, Irvine, CA], brimonidine) are glaucoma medications that have the side effect of causing stimulation to Müller's muscle in the upper eyelid, leading to 1 to 2 mm of eyelid elevation. Patients using these medications could have a subtle ptosis that is pharmacologically hidden, which can affect the results of blepharoptosis surgery if they are later taken off this medication. Some glaucoma medications (e.g., prostaglandins) may enhance eyelash growth and trichiasis.

Another potentially serious ocular symptom is visual disturbance, which should be evaluated prior to any periocular surgery. Patients with transient visual changes can have underlying optic nerve, macular, or retinal disease, which may be related to carotid artery or cardiac disease. Peripheral visual field deficits may arise from optic nerve disease such as glaucoma, ischemic events, retinal detachments, or other retinal pathology. Double vision has an extensive differential diagnosis that needs evaluation prior to periocular surgery to rule out a serious underlying condition and to avoid postoperative blame on the surgeon. Glare symptoms can be due to tear film instability, corneal disease, or cataract. These symptoms and patient satisfaction can worsen following eyelid elevating procedures so caution is necessary.

Symptoms such as ocular discharge and crusting of the eyelids may indicate a chronic eye infection or inflammatory process that can be a significant risk factor for a postoperative infection and wound healing. Frequent sty and chalazia formation on the eyelids often indicate inspissation of the meibomian glands and concomitant blepharitis, which may be associated with rosacea. In addition to the increased infection risk, these patients are at risk for exacerbation of dry eye syndrome. These patients may benefit from being placed on tetracycline or doxycycline preoperatively.

Patients need to be asked if they have had recent Botox<sup>®</sup> (Allergan, Irvine, CA) (botulinum toxin A) therapy as this can effect preoperative measurements and operative results as improper administration can lead to blepharoptosis. Other concerns with botulinum toxin use are the weakening effect on orbicularis tone and potential alterations of eyelid positioning leading to postoperative corneal exposure problems. Significant oculofacial asymmetries may also be masked by botuli-

num toxin use. Patients are generally safe to receive botulinum toxin a few weeks following surgery if swelling is resolved. It should be administered at the time of surgery only to sites remote from the operative locations to avoid inadvertent spread to undesired locations that can lead to blepharoptosis, weakened orbicularis tone.

Many medications and supplements can increase the risk of intraoperative and postoperative bleeding (Tables 2 and 3). This can lead to worsened bruising, swelling, and a subconjunctival hemorrhage, a non-vision-threatening but often highly upsetting event for patients who were not forewarned. In 1974, DeMere et al<sup>1</sup> reported an incidence of permanent visual loss of 0.04% (1:2500) for blepharoplasty surgery. A recent study among members of the American Society of Ophthalmic Plastic Reconstructive Surgeons found a reported rate of orbital hemorrhage with cosmetic eyelid surgery of 0.055% (~1:1800) with a risk of permanent visual loss at 0.0045% (~1:22,000).<sup>2</sup> Despite this seemingly low occurrence, the potentially disastrous visual outcome and legal implications are substantial, and we highly recommend patients stop any elective blood-thinning medications or supplements at least 10 days before surgery. If there is any question about the safety of stopping a medication or for those with high risk for substantial cardiac or neurological injury, we advise the patient to get clearance from their managing primary care physician. These patients should be counseled about the increased risks of excessive bleeding and visual loss.

There are also an increasing number of supplements (Table 4) that can increase bleeding risk, so we recommend stopping supplements, including daily vitamins. In general, we tell patients to take no pain relievers other than acetaminophen for a few weeks prior to surgery. The only currently available nonsteroidal anti-inflammatory medication that patients may continue to take is Celebrex<sup>®</sup> (Pfizer, Inc., New York, NY) (celecoxib), and for patients without risk factors we find this helps with postoperative swelling and pain. Other risk factors for postoperative hemorrhage are poorly controlled hypertension, postoperative vomiting, and increased physical activity. We routinely discuss these issues and the importance of continuing their antihypertensives, and we routinely prescribe intraoperative and postoperative antiemetics for patients with a history of postoperative nausea or for general anesthesia surgeries. We also discuss the importance of avoiding any excessive activity for the first few postoperative days.

It is important to notify patients of the signs and symptoms of a retrobulbar hemorrhage, with instructions to call immediately if there is any change of vision or increasing orbital pain or proptosis. A helpful test patients can check is the red desaturation test, which is an early indicator of optic neuropathy. This test is performed by looking at a red object one eye at a time and noting if the red object is darker, more faded, or less

**Table 2 Orally Administered Medications That Increase Bleeding Time (Adapted from Bartley and Warndahl<sup>22</sup>)—Preparations Containing Aspirin or Salicylic Acid Derivatives**

217	Damason-P	Neogesic
217 Strong	Darvon compound	Nervine
4-Way Cold tablets	Darvon compound-65	Night-time Effervescent cold tablets
Acuprin 81 (aspirin)	Darvon with ASA	
Adult Analgesic pain reliever	Darvon-N with ASA	Norgesic
	Dasin	Norgesic Forte
Aggrenox	Disalcid	Norwich extra-strength aspirin
Alka-Seltzer	Dolcin	
Anacin	Dolomine	Novasen
Analval	Dolprn #3 tablets	Orphenagesic
Anodynos	Drinophen	Orphenagesic Forte
Antidol	Duradyne	Oxycodone and aspirin
Anthropan	Easprin	P-A-C
APAC Improved	Ecotrin	Pain Aid
APC	Emagrin	Pain reliever tablets
APO-ASA	Empirin	Pabrin buffered tabs
APO-ASEN	Empirin with codeine	Panodynes
Arco Pain	Emprazil	Pepto-Bismol
Argesic	Encaprin	Percodan
Arthritis	Entrophen	Percodan-Demi
Arthritis Pain Formula	Equagesic	Persistin
Artria SR	Equazine-M	Phenetron compound
Arthrotec	Excedrin	Phenylbutaxone
ASA	Fiogesic tablets	PMS with ASA
Ascriptin	Fiorgen PF	Presalin
Ascodeen	Fiorinal	Propoxyphene compound
Aspercin	Fiorinal with codeine	Propoxyphene napsylate with ASA
Aspergum	Gelpirin tablets	
Aspermin	Gemisyn	Quiet World tablets
Aspirin	Genaced	Rhinoceps
Aspirin with codeine	Genacote	Robaxisal tablets
Aspir-Low	Genprin	Roxiprin
AspirTab	Gensan	Roxiprin tablets
Aspirtab Max	Goody's extra strength	S-A-C
Astone	Goody's Headache powder	Salabuff
Astrin	Halfprin	Salatin
Atromid	Headache tablet	Saleto
Axotal	Healthprin	Salflex
Azdone tablets	Herbopyrine	Salicylamide
Azolid	Instantine	Salocol
B-A-C tablets	Isollyl Improved	Salsalate
Bayer aspirin	Kalmex	Sine-Off sinus medicine tablets
Bayer children's cold tablets	Lanorinal	
	Lortab with ASA	Sloprin
BC powder	Magnaprin	Soma compound tablets
BC tablets	Marnal	Soma compound with codeine
Buffaprin	Measurin	
Buffasal	Methcarbamol with aspirin	St. Joseph
Bufferin	Micrainin	Stanback powder
Buffets II	Meprobamate and aspirin	Supac
Buffex	Meprogesic Q	Synalgos-DC capsules
Buffinol	Midol for cramps, maximum strength	Talwin compound
Butalbital		Tenol-Plus

**Table 2 (con't)**

C2	Midol Original	Trigesic
CP-2	Mobidin	Trilisate
Calmine	Mobigesic	Tri-Pain
Cama arthritis pain reliever	Momentum muscular backache formula	Ursinus Inlay-Tabs
Carisoprodol compound		Valesin
Children's aspirin	Neocylate tabs	Vanquish
Clinoril		Verin
Congesprin chewables		Wesprin Buffered
Cope		Zorprin
Coryphen		

brilliant in one eye over the other; the red appears washed out on the affected side.

Cold urticaria is a rare but underrecognized cause of postoperative swelling that can be potentially fatal, and therefore a suggestive history should be identified in the preoperative process.<sup>3</sup> Cold urticaria is either primary or secondary with both localized and systemic potentially fatal forms. This condition can manifest following the use of postoperative ice compresses and be difficult to diagnose. The following three questions should preoperatively identify patients with this condition: (1) Do you have any history of hives or swelling after contact with ice or other cold objects? (2) Do you have any difficulty drinking cold beverages? (3) Do you have any other history of recurrent hives, swelling, or anaphylaxis? If this condition exists then consultation with an allergist and special precautions are required.

### GENERAL FACIAL ASSESSMENT AND OCULAR IMPORTANCE

Starting the exam from top of the head and progressing downward to the neck can reveal issues that can affect periorbital surgery. Skin quality, neoplasms, dyschromias, and actinic damage should be evaluated as these issues can impact the surgical result and patient satisfaction if not addressed. For example, patients with frequent basal cell cancers around the eyes should conserve as much of their periocular skin as possible; it may not be wise to remove skin that could be required for later reconstructive eyelid surgery. Although alternative skin graft sites for eyelid reconstruction are available, the best skin graft for eyelid reconstruction is with eyelid skin. Additionally, a patient with any suspicious lesions on the eyelids should have them biopsied first to ensure they are not malignant, which would likely require wide-excision or Mohs surgery and reconstruction.

Patients with thick, heavily sebaceous skin generally achieve less improvement than patients with smooth and lightly to modestly pigmented skin. They

are also at increased infection risk if there are numerous, large open comedones. Darker pigmented patients should be asked about prior surgical or traumatic scars that have healed poorly (e.g., keloid formers) and be notified of the risk of hyperpigmented scars. Fortunately, keloid scarring in the thin skin of the eyelids is rare. Fair-complected patients should be notified about their higher risk for more visible, erythematous scars. Preexistent areas of scarring should be documented and photographed.

Facial asymmetry or craniofacial deformities should be assessed and pointed out preoperatively to the patient as they may become a focus of concern and dissatisfaction postoperatively. Most patients have some degree of asymmetry between the eyebrow positions and palpebral fissures. Orbital and eyelid asymmetry will be discussed in further detail under the ocular exam. Areas of facial weakness should be noted, especially documenting orbicularis muscle tone and Bell's reflex quality. After the initial physical assessment then the ocular exam should be performed.

### TARGETED OCULAR EXAMINATION

Ophthalmologists examine the eye and visual system by a systematic eight-part exam beginning with the external exam and working toward the intraocular exam. The eight-part exam includes: (1) visual acuity; (2) peripheral visual fields (confrontational); (3) external periocular exam (musculoskeletal and skin findings of the forehead, midface, and lower face); (4) extraocular muscles (motility) including a cover-uncover test; (5) pupils; (6) slit lamp examination of the eyelids, eyelashes, lacrimal system, and anterior segment (conjunctiva, cornea, anterior chamber); (7) fundus and optic nerve; and (8) intraocular pressure.

For any surgeries on the eyelids, forehead, or midface, we recommend a comprehensive ophthalmic examination by a qualified provider. If a patient with a retinal detachment, dry eye, or diplopia is not diagnosed before surgery, then it may be determined by default to be a complication of surgery. Patients should be questioned

**Table 3 Orally Administered Medications that Increase Bleeding Time (Adapted from Bartley & Warndahl<sup>22</sup>)—Preparations That Mostly Contain Nonsteroidal Anti-inflammatory Agents**

Aches-N-Pain (ibuprofen)	Ibifon 600 (ibuprofen)	Novo-Sundac (sulindac)
Actiprofen (ibuprofen)	Ibren (ibuprofen)	Novo-Tolmetin (tolmetin)
Actron (ketoprofen)	IBU (ibuprofen)	Nu-Diclo (diclofenac)
Addaprin (ibuprofen)	Ibu 200 (ibuprofen)	Nu-Flubiprofen (flurbiprofen)
Advil (ibuprofen)	Ibu 400 (ibuprofen)	Nu-Ibuprofen (ibuprofen)
Advil Cold & Sinus (ibuprofen)	Ibu 600 (ibuprofen)	Nu-Indo (indomethacin)
	Ibu 800 (ibuprofen)	Nu-Naprox (naproxen)
Aleve (naproxen sodium)	Ibuprin (ibuprofen)	Nu-Pirox (piroxicam)
Anaprox (naproxen sodium)	Ibuprofen	Nuprin (ibuprofen)
Anaprox DS (naproxen sodium)	Ibuprohm (ibuprofen)	Nu-Sulindac (sulindac)
	IBU-TAB (ibuprofen)	Oraflex (benoxaprofen)
APC	Indochron ER (indomethacin)	Orudis (ketoprofen)
Anthropan (salicylate)	Indocid (indomethacin)	Orudis E (ketoprofen)
Ansaid (flurbiprofen)	Indocin (indomethacin)	Orudis KT (ketoprofen)
APO-Diclo (diclofenac)	Indomethacin	Orudis SR (ketoprofen)
APO-Diflunisal (diflunisal)	Ketoprofen	Oruvail (ketoprofen)
APO-Flurbiprofen (flurbiprofen)	Ketorolac	Oxaprozin
	Lodine (etodolac)	Pabalate-SF tabs
APO-Ibuprofen (ibuprofen)	Magan	Pamprin-IB (ibuprofen)
APO-Indomethacin (indomethacin)	Magsal	PediaProfen (ibuprofen)
	Marnal	Piroxicam
APO-Keto (ketoprofen)	Measurin	Ponstan (mefenamic acid)
APO-Napro (naproxen)	Meclofenamate	Ponstel (mefenamic acid)
APO-Napro-Na (naproxen sodium)	Meclomen (meclofenamate)	Q-Profen (ibuprofen)
	Medipren (ibuprofen)	Relafen (nabumetone)
APO-Naproxen (naproxen)	Mefenamic	Rhdis (ketoprofen)
APO-Piroxicam (piroxicam)	Meloxicam	Rufen (ibuprofen)
APO-Sulin (sulindac)	Menadol (ibuprofen)	Saleto-200 (ibuprofen)
Argesic (salsalate)	Midol 200 (ibuprofen)	Saleto-400 (ibuprofen)
Arthrotec (diclofenac and misoprostol)	Midol IB (ibuprofen)	Saleto-600 (ibuprofen)
	Mobic	Saleto-800 (ibuprofen)
Aspergum (aspirin)	Motrin (ibuprofen)	Sine-Aid IB (ibuprofen)
Atromid (clofibrate)	Motrin IB (ibuprofen)	Sulindac
Azolid (phenylbutazone)	Motrin IB Sinus (ibuprofen)	Synflex (naproxen)
Bayer Select (ibuprofen)	Nalfon (fenoprofen calcium)	Synflex SR (naproxen)
Buf-tabs	Naprelan (naproxen)	Tolectin (tolmetin sodium)
Butazolidin (phenylbutazone)	Napron X (naproxen)	Tolectin (tolmetin sodium)
	Naprosyn (naproxen)	Tolmetin
Cataflam (diclofenac)	Naprosyn E (naproxen)	Toradol (ketorolac)
Clinoril (sulindac)	Naprosyn SR (naproxen)	Trendar (ibuprofen)
CoAdvil (ibuprofen)	Naproxen	Ultraprin (ibuprofen)
Cotylbutazone (phenylbutazone)	Naproxen sodium	Unipro (ibuprofen)
	Naxen (Naproxen)	Valprin (ibuprofen)
Cramp End (ibuprofen)	Novo-Difenac (diclofenac)	Voltaren (diclofenac)
CP-2 tabs	Novo-Diflunisal (diflunisal)	Voltaren Rapide (diclofenac)
Daypro (oxaprozin)	Novo-Flurprofen (flurbiprofen)	Voltaren SR (diclofenac)
Diclofenac	Novo-Keto-EC (ketoprofen)	
Diflunisal	Novo-Methacin (indomethacin)	
Dimetapp Sinus (ibuprofen)	Novo-Naprox (naproxen)	
Dolgesic (ibuprofen)	Novo-Naprox Sodium (naproxen sodium)	
Dolobid (diflunisal)		
Dristan Sinus (ibuprofen)	Novo-Pirocam (piroxicam)	
Duoprin	Novo-Profen (ibuprofen)	

**Table 3 (con't)**

Durasal
EC-Naprosyn (naproxen)
Etodolac
Excedrin IB (ibuprofen)
Feldene (piroxicam)
Fenoprofen
Four-way cold tabs
Flurbiprofen
Froben (flurbiprofen)
Gaysal
Genpril (ibuprofen)
Haltran (ibuprofen)

and examined for previous ocular or eyelid surgery. A scleral incision or laceration never obtains more than 75% wound strength and only 60% by a year. Patients who have undergone glaucoma filtration surgery, bleb or shunt, run the risk of surgical failure and vision loss. Typically these filters and shunts are in the superior conjunctiva, and if the eyelid is left too high or tight, then these areas may become exposed, leading to a higher risk of infection, ocular irritation, failure, or even bleb infection, and may rupture with potential loss of the eye.

Patients who will be undergoing cataract or refractive laser surgery should wait a few months before or after undergoing elective eyelid surgery. Refractive changes, particularly astigmatic, can be induced by eyelid surgery. In addition, dry eye syndrome may be exacerbated following refractive (e.g., LASIK) surgery, increasing the risk of dry eye complications following surgical repositioning of the upper eyelids. Lateral eyelid tightening procedures are particularly prone to inducing astigmatic changes that can affect the vision for a few months and the critical measurements needed for determining intraocular lens power and refractive surgery. An additional concern with patients who have undergone refractive surgery and also those with a history of herpetic keratitis is a reduction of corneal sensitivity that can lead to corneal breakdown if the eyelids are overly elevated since the stimulus to blink is reduced. It can take up to 6 months or more for corneal sensitivity to return following refractive surgery, and return of sensation may not be complete.

At a minimum, the visual acuity of each eye should be tested and documented. Visual loss following

surgery carries a high medicolegal liability, and a case is cited in the literature of a patient who attempted to sue his surgeon for a preexisting total monocular blindness.<sup>4</sup> Any surgeon operating on the eyelids should have a visual chart, which can be attached to a wall or door. Normal visual acuity, as measured in the United States, is designated as 20/20. This indicates the person being tested can see at 20 feet what the "average" person can see at this same distance, in good ambient light. Decreased visual acuity of 20/40 indicates the individual being tested can see at 20 feet what an "average" person can see at 40 feet, whereas someone with spectacular 20/15 vision can see at 20 feet what the "average" person must be 15 feet away to see. Patients who cannot see 20/20 with their glasses or contact lenses in place should likely have an ophthalmic exam prior to surgery. What is most important is the best-corrected visual acuity, which can be approximated with a pinhole. Near vision testing may also be done if a wall chart is not available but can be more variable if the vision card is not held at the proper distance or if patients have forgotten their reading glasses.

Any detected peripheral visual field loss or double vision should be documented and evaluated prior to surgery. Injury to the inferior oblique muscle or superior oblique tendon during blepharoplasty surgery can result in transient or permanent diplopia. Mazow et al reported a case of injury to the medial rectus muscle following a four-lid blepharoplasty.<sup>5</sup> Anisocoria, or significantly asymmetric pupils (greater than 1 to 2 mm difference), should also be documented and evaluated by an ophthalmologist. Horner's syndrome,

**Table 4 Other Agents That Can Cause Excessive Bleeding**

Prescription	Herbal Supplements
Coumadin (Warfarin), ticlopidine (Ticlid), clopidogrel (Plavix), cilostazol (Pletal), dipyridamole (Dipridacot, Persantine), fentanyl (Duragesic patch), perfenazine (Etrafon, Tilafon), baclofen (Lioresal), panalgesic (gold), parnate, selenium	Bilberry, chamomile, dong quai root, echinacea, ephedra, vitamin E, feverfew, fish oil, flaxseed, garlic, ginger, ginkgo, ginseng, kava, soma, St. John's wort, valerian, willow bark, yohimbe

**Table 5 Conditions That Warrant Undercorrection of Upper Eyelid Height**

Poor tear film/dry eye syndrome
Poor Bell's phenomenon or blink reflex
Poor ocular motility
Lower eyelid retraction
Enlarged pupil(s) or superior pupillary defect
Orbicularis weakness and/or preexisting lagophthalmos
Reduced corneal sensation
Preexistent photophobia, keratitis, ocular irritation

which can be associated with potentially serious underlying disease, is a triad of miosis, blepharoptosis, and anhidrosis. A pupil can be dilated or irregular due to prior intraocular surgery/injury, optic nerve disease, or an orbital mass. Patients with an excessively large pupil or superior defect (e.g., iridectomy) may need to be undercorrected with upper eyelid repositioning surgery to avoid asymptomatic photophobia, glare, or monocular diplopia. The swinging flashlight test should be performed to assess for a relative afferent pupillary defect (Marcus Gunn pupil) that may herald the presence of an occult retinal or optic nerve lesion, which would require further evaluation before surgery.

It is important to document and preferably also discuss any asymmetric findings with patients, particu-

**Table 6 Periorbital Changes Associated with Orbital Disease<sup>23</sup>**

Sign	Etiology
Salmon-colored mass in cul-de-sac	Lymphoma
Eyelid retraction/lag	Thyroid-associated orbitopathy
Vascular congestion over recti muscle insertions	Thyroid-associated orbitopathy
Corkscrew conjunctival vessels	Arteriovenous fistula
Vascular anomaly of eyelid	Lymphangioma, varix, capillary hemangioma
S-shaped eyelid	Plexiform neurofibroma
Anterior uveitis	Idiopathic orbital inflammatory syndrome, sarcoidosis
Eczematous eyelid lesions	Mycosis fungoides (T-cell lymphoma)
Ecchymoses of eyelids	Neuroblastoma, leukemia, amyloidosis
Prominent temple	Sphenoid wing meningioma
Lower eyelid edema	Meningioma, inflammatory tumor, metastases
Black-crust lesions	Phycomycoses
Facial asymmetry	Fibrous dysplasia and neurofibromatosis
Gaze-evoked amaurosis	Optic nerve sheath meningioma, orbital apex or intraconal tumor

larly the discerning cosmetic patient. Going over preoperative and postoperative photos helps alleviate patient concerns following surgery when preexistent asymmetries or lesions were present but not addressed. Ideally, however, these asymmetries should be thoroughly discussed preoperatively, which helps ensure realistic expectations and reduces blame on the surgeon for any perceived postoperative changes or blemishes.

Evaluation of the corneal protective responses is also important as part of the preoperative workup. Bell's phenomenon is tested by having the patient close their eyes while the examiner forces them open to see the position of the cornea, which should be deviated upward. Corneal testing with fluorescein dye should also be performed, and patients who demonstrate staining should also have corneal sensitivity testing, which can be done with the fine fibers of a cotton tip applicator. Basal tear testing showing less than 5 mm on a Schirmer's strip after 5 minutes is consistent with severe dry eyes.

Patients with a poor Bell's phenomenon, poor tear film, and/or orbicularis weakness need to avoid upper eyelid overcorrection to lessen postoperative corneal problems (Table 5). Evaluation of the conjunctiva for excessive erythema or the presence of raised abnormalities (e.g., pinguecula, pterygium) can help identify dry eye patients. This will also identify the presence of any masses, preexistent scarring, or prior surgery (glaucoma filtering bleb/shunt; orbital; lower eyelid). Any patient undergoing periocular surgery should also be assessed and documented for full eyelid closure to limit postoperative exposure risks.

## EYELID AND ADNEXAL EXAMINATION

Prior to performing a detailed eyelid examination, it is helpful to evaluate orbitofacial symmetry. One eye can be higher than another due to orbital bone differences or orbital disease. It is helpful to obtain a worm's-eye view by having the patient tilt their head back and viewing the patient from below, looking up toward the patient's forehead. This helps identify any exophthalmos or enophthalmos. It also can identify the presence of malar and orbital rim area depressions or irregularities.

Patients with prominent globes from whatever cause are at higher risk for exposure following elevating upper eyelid surgery and especially following lower eyelid surgery if lower eyelid laxity is not addressed. However, overtightening of the lower eyelid in the presence of a prominent globe carries a significant risk of lower eyelid retraction and lagophthalmos. The most common cause of bilateral or unilateral proptosis with or without eyelid swelling is thyroid orbitopathy. Patients with eyelid retraction and unexplained, recent edema or proptosis must be worked up for thyroid orbitopathy. Standard blepharoplasty surgery in progressive thyroidopathy may lead to serious visual loss and ocular complications. Other



causes for prominent globes include malar hypoplasia, high myopia, and shallow orbital rims. Causes of proptosis, however, comprise an extensive differential and potential workup. Patients with significant proptosis can suffer significant ocular damage if overly aggressive eyelid surgery is performed due to postoperative lagophthalmos. Additionally, patients may have a serious orbital process that can have both visual and systemic implications if left undiagnosed and untreated. For example, enophthalmos can be due to metastatic scirrhous breast cancer. Therefore, patients with proptosis or enophthalmos of unknown cause need evaluation and workup by an ophthalmologist prior to elective eyelid surgery.

Differences in the canthal angles, intercanthal distances, and eyelid positions should be noted and evaluated for an underlying explanation. Facial asymmetry may also be due to facial nerve weakness. Both sides of the face should be tested for facial muscle strength with particular attention to orbicularis tone. Proper orbicularis function is critical for eyelid closure, eyelid position, and proper tear function. Previously operated eyelids often will have diminished orbicularis strength that can be further weakened following additional surgeries and lead to ocular complications (e.g., exposure keratopathy, tearing, prolonged swelling).

Evaluation for forehead and eyebrow symmetry should then be performed. Arching forehead wrinkles from overactive frontalis muscle action often signify a patient with significant brow ptosis. Other signs of brow ptosis include deep horizontal forehead rhytids. Overactive frontalis action can be reduced by having the patient relax, looking downward, and by massaging the forehead muscles. If these attempts are unsuccessful, then having the patient depress the brows or close the eyes for a few moments can be helpful. Once the brows are in a rested state, a more reliable assessment of brow position may be performed.

Accurate assessment of brow ptosis is essential as correction of dermatochalasis or blepharoptosis without correction of concomitant brow ptosis will frequently lower the height of the eyebrows further, yielding both an unsatisfactory functional and aesthetic result. With experience the evaluation for brow ptosis can be done without measurements. However, a useful measurement is the distance between the lower corneal limbus to the central inferior brow cilia with the patient in primary gaze. If this measurement is less than 22 mm, then the patient, especially if female, likely needs correction of the brow ptosis for an optimal result.<sup>6</sup> This is a more reliable measurement than the distance from the upper eyelid margin to the inferior brow cilia, which varies with the presence of blepharoptosis or eyelid retraction. Documentation of the location of the brow ptosis should be performed (e.g., medial, lateral, both). Lateral brow ptosis is manifested by temporal hooding over the eyes. One should keep in mind that ideal features of the

female brow are a high, mildly arched eyebrow whereas men generally have a lower, straight brow, perpendicular to the nose, with a less prominent sulcus and a low subtle eyelid crease.

Upper eyelid evaluation should begin with assessment for excessive skin and fat prolapse. Fat herniation in the upper eyelids is generally most prominent at the medial aspects. It is important to distinguish fat from eyelid edema, which can be done by gently pressing on the opposing eyelid and noting if the fullness protrudes forward (generally indicating fat and not edema). Lateral fullness can be secondary to lateral brow ptosis, descent of the brow fat pad, or lacrimal gland prolapse. It is helpful to palpate, raise the brow, and evert the eyelid to ascertain the cause. Careful inspection of the eyelid margins should also be performed looking for neoplasms, missing lashes, and permanent makeup, which can be altered following eyelid surgery.

Next, it is important to identify the presence of excessive skin and possible coexistent blepharoptosis. We recommend the use of a cotton tip applicator to gently roll in or push up the excessive skin so that any underlying blepharoptosis may be noted. It is then important to measure the upper lid crease position, the vertical fissure height, and the levator function. The vertical fissure height can show wide variability in the same patient unless the brow is placed in a fixed position and the frontalis muscle is relaxed or immobilized. The patient should be measured in primary gaze. The normal fissure heights average 9 to 10 mm with a range of normal from 7 to 12 mm. The upper eyelid should generally rest ~1 to 2 mm below the superior corneal limbus, and the lower eyelid normally rests at or within 1 mm above the lower corneal limbus.

The upper eyelid crease rests 9 to 11 mm above the eyelid margin. The natural eyelid crease can be found by lifting the eyebrow and asking the patient to look downward, then upward slightly, then downward again. The crease normally lies at the upper edge of the tarsus. In patients with aponeurotic blepharoptosis, the upper eyelid crease may be raised significantly higher. In general, men and Asians have smaller eyelid fissure heights and lower upper eyelid creases; raising the upper eyelid crease may elicit an unwanted feminized appearance.

Levator function is best measured by immobilizing the brows and having the patient look from extreme down gaze to up gaze, with normal values range from 12 to 18 mm. Most agree that that blepharoptosis should be corrected at the same time as blepharoplasty. Blepharoptosis is measured by noting the distance in millimeters between the upper eyelid margin to the pupillary light reflex (MRD1) in primary gaze. Normal values range between 4 and 5 mm. A reduced MRD1 may also be due to pseudoptosis from excessive skin. This can be distinguished from a separate or concomitant blepharoptosis by gently mobilizing the skin out of the way with a

cotton tip or digitally and noting if the MRD1 is still reduced. Another useful measurement is to measure the palpebral heights in down gaze, with values less than 2 mm highly suggestive of blepharoptosis and a likely cause of significant visual complaints during reading. Children with blepharoptosis need fully dilated eye exams, retinoscopy, and amblyopia assessment. Marcus Gunn jaw-winking should be specifically excluded by asking the patient to activate their pterygoid muscles by protruding their chin or moving their lower jaw from side to side. This is paramount if there is a history of the lid height varying with eating/chewing. Another aberrant regeneration phenomenon, more common in adults, can follow a facial palsy. In this scenario the eyelid height varies with facial expression (e.g., the eyelid rises on recruiting muscles of facial expression); this would be a relative contraindication to surgery as the results will be unpredictable.

One should evaluate ocular motility carefully to make certain there is not an associated supraduction deficit under the ptotic upper eyelid. A cover-uncover test will unmask a pseudoptosis associated with a hypotropia.

Unilateral blepharoptosis can also be a sign of an infiltrative or encapsulated mass, so patients should be evaluated for proptosis and resistance to globe retropulsion. With unilateral or asymmetric ptosis, one should lift the ptotic eyelid and observe if the contralateral upper eyelid lowers as a result of Hering's law, although this is not always predictable preoperatively.

The lower eyelids should be evaluated for eyelid position and stability. The lower eyelids should rest at the lower corneal limbus. Malpositions such as retraction, entropion, and ectropion should be documented and addressed. The snap test, which assesses orbicularis tone, is performed by pulling gently on the lower eyelids and seeing if they quickly snap back into position without requiring an eyelid blink. A positive test is noted by the eyelid staying in a distracted state until the patient blinks or the eyelid only very slowly returning to its normal position against the globe. The distraction test, which evaluates laxity of the tarsoligamentous sling, is performed by pulling on the eyelid, which should not pull away from the globe more than 6 mm.

Horizontal laxity may be due to both medial and lateral canthal tendon attenuation, which can be determined by digitally pushing on the tendons toward the cornea; movement more than a few millimeters indicates laxity. Excessive lower eyelid excursion may be due to weakened orbicularis tone and this in conjunction with lower eyelid laxity can lead to retraction, ectropion, lagophthalmos, and exposure keratopathy if not addressed during lower eyelid surgery (e.g., cosmetic lower eyelid blepharoplasty; resurfacing; chemical peels). In general, lower eyelid excursion from primary gaze to down gaze should be ~4 to 5 mm, and reduced measure-

ments should heighten suspicion for lower eyelid retractor disinsertion. Patients should also be asked to open their mouth while looking straight ahead, and if the lower eyelid position lowers, indicative of insufficient skin, then they are at significant risk of lower eyelid retraction if lower eyelid skin is removed.

Excess lower eyelid skin and prolapsed orbital fat should then be evaluated. Gentle pressure on the globe through the closed eyelids will accentuate areas of prominent fat herniation. There are three distinct fat pads in the lower eyelids and two in the upper eyelids. The fat should be palpated to assess for abnormal firmness that may represent an occult process (e.g., lymphoma, sarcoid). Much less fat is now removed than in the past to avoid the aged, sunken eyelid appearance. Lower eyelid fat is more commonly repositioned into the "tear trough" deformity. Lower eyelid fluid retention, which can produce malar festoons, are difficult to manage and should be pointed out to the patient seeking lower eyelid blepharoplasty. Festoons are not improved by standard blepharoplasty techniques and can worsen following surgery, although lateral orbicularis suspension may partially ameliorate those festoons related to sagging of the orbicularis muscle. Fullness of the lower eyelids may also be caused by orbicularis hypertrophy, which can be emphasized by having the patient smile.

## OCULAR AND EYELID CONDITIONS WITH SURGICAL RELEVANCE

Eyelid edema can be caused by a variety of conditions, including systemic allergy, hypertension, sodium retention, blepharitis, low-grade infections, thyroid disorders, renal disease, anemia, lymphedema, and parasites.<sup>7</sup> Patients with identifiable systemic causes should have these issues managed prior to undergoing eyelid surgery, which will markedly worsen their swelling. Blepharochalasis is a hereditary disorder usually seen in younger patients and is manifested by recurrent eyelid edema and thin, redundant eyelid tissues. Festoons, also known as "cheek bags," generally result from localized fluid retention as well as attenuation, degeneration, and involution of the orbicularis muscle and overlying skin.<sup>8</sup> Orbital fat herniation and midface descent can exacerbate their appearance.

Eyelash ptosis can be due to entropion of the upper eyelid, conjunctival disease, or floppy eyelid syndrome, an age-related finding in older patients. Blepharitis is an inflammatory condition of the eyelid margin with many underlying causes that include bacterial, viral, and seborrheic. Blepharitis can increase the risk for postoperative infection if untreated, and ~50% of patients also have dry eye syndrome. Eyelid erythema may also be due to rosacea, prominent vascularity, local irritation, or inflammation of the eye, lacrimal sac, orbit,

and eyelid skin. Underlying causes can usually be found by performing a thorough slit-lamp examination.

Hypertrophic orbicularis is often a cause of fullness of the lower eyelid immediately below the eyelid margin. It is more prominent in patients with an exaggerated smile or squint and is distinguishable from edema and fat by having the patient smile and squint while noting the increase of fullness.<sup>8</sup>

Cicatrizing conjunctival diseases can be a contraindication for elective surgeries involving a conjunctival incision due to the severe risk for worsened scarring and visual loss and discomfort from symblepharon, entropion, and trichiasis from inverted eyelashes. An example is ocular cicatricial pemphigoid, a systemic autoimmune disease, which produces scarring of the affected skin and particularly of the conjunctiva and mucous membranes. This condition can be idiopathic or locally induced from several glaucoma medications to include pilocarpine, epinephrine, timolol, and echothiophate iodide, often referred to as ocular pseudopemphigoid.<sup>9</sup> Other conditions with cicatricial conjunctival risks include rosacea, conjunctival malignancies, prior trauma or surgery, and sarcoidosis.<sup>10</sup>

Blepharophimosis syndrome is an autosomal-dominant condition with telecanthus (widening of intercanthal distances), severe eyelid ptosis, eyelid phimosis (narrowed horizontal palpebral fissures), and epicanthus inversus (fold of skin extending from the upper to lower eyelid at the medial canthus). Other findings can include lower eyelid ectropion, anterior lamellar deficiencies, hypoplasia of the superior orbital rims, and poorly developed nasal bridge.<sup>11</sup> Blepharophimosis of the eyelids can also be due to progressive systemic sclerosis from subepithelial fibrosis of the conjunctiva.<sup>10</sup>

Several systemic malignant conditions also have eyelid manifestations. Muir-Torre syndrome describes the occurrence of sebaceous hyperplasia, adenoma, epithelioma and carcinoma, basal cell carcinoma with sebaceous differentiation, or keratoacanthoma with visceral cancer.<sup>12,13</sup> Because benign sebaceous tumors of the ocular adnexa are extremely rare, their presence should raise suspicion for associated internal carcinoma. Cowden's disease is an association between multiple trichilemmomas, benign hair follicle tumors, and several underlying systemic conditions to include but not limited to dysthyroidism, central nervous system changes, intestinal polyps, and breast disease.<sup>14</sup> Basal cell nevus syndrome (Gorlin's syndrome) is characterized by multiple basal cell carcinomas and an increased risk for ovarian cancer and medulloblastoma.<sup>15,16</sup> Carney's complex is a familial multiple neoplasia syndrome consisting of myxomas that can involve the eyelid, caruncle, and other organs including lethal cardiac involvement.<sup>17</sup> Acanthosis nigricans can manifest as multiple eyelid papillomas and internal malignancy.<sup>18</sup>

Myasthenia gravis is a neurological condition that can be ocularly isolated or be systemic. Patients with ocular myasthenia often have variable blepharoptosis characterized by fatigability, which is frequently accompanied by variable or intermittent diplopia. One test for myasthenia is to have the patient look in extreme up gaze for 1 to 2 minutes and observe for worsening ptosis. The ice test is another simple way to evaluate for this condition by applying ice for 2 minutes and then looking for improvement of the ptosis; this test is considered positive if there is at least 2-mm improvement in the ptosis. About 10% of patients with myasthenia will have a thymoma. The most sensitive test for myasthenia is single-fiber electromyography, and the most specific test is a serum acetylcholine receptor antibody titer. Patients suspected of myasthenia sometimes require tensilon testing and should avoid eyelid surgery until their condition has been medically stabilized. If levator function remains variable, they may require frontalis suspension for ptosis correction, although some myasthenic patients with chronic, stable ptosis respond well to levator resection.

Other acquired myopathies (e.g., myotonic dystrophy, oculopharyngeal dystrophy, and chronic progressive external ophthalmoplegia) also portend a poor surgical result due to reduced levator function and weak orbicularis function and disease deterioration. Variability is common with myasthenia but not myopathies. Patients with poor ocular motility are at risk for postoperative exposure keratopathy even with minimal amounts of eyelid lagophthalmos due to poor Bell's phenomenon, which is exacerbated by weak orbicularis muscle due to myopathy. Another neurological disease with ocular importance is Parkinson's, which affects the blink response. Because these patients have a poor blink response, they should undergo only conservative eyelid surgery, and preservation of the underlying orbicularis during upper blepharoplasty is important for corneal protection.

## IMPORTANT DISEASES OF OCULAR SIGNIFICANCE

Many conditions carry high ocular risks for patients who undergo eyelid surgery. This is because many systemic conditions have serious ocular surface and eyelid manifestations (Table 6). For example, psoriasis can have a Koebner reaction even in the eyelids, creating psoriatic weltlike lesions at the incisions. Rosacea patients commonly have severe dry eye syndrome and risk for peripheral ulcerative keratitis, can bleed more excessively during surgery, and will likely have more prominent swelling and scar visibility. Rosacea patients also frequently have blepharitis, which carries a higher surgical infection risk. Rosacea symptoms can be triggered by alcohol, spicy foods,

changes in temperature, and exposure to irritant chemicals. Patients diagnosed with severe forms should be evaluated and managed to avoid ocular complications. Oral therapy with tetracycline, doxycycline, or erythromycin and avoidance of triggers can be very helpful in the perioperative period.

Thyroid-associated ophthalmopathy should be recognized and, if active, no eyelid surgery should be performed for at least 6 months until the condition is stabilized. Eyelid surgery has been known to exacerbate the eyelid and orbital inflammation in patients with active thyroid-associated orbitopathy. A detailed discussion is beyond the scope of this article, but thyroid orbitopathy is a well-known cause of proptosis, eyelid retraction, diplopia, eyelid lag on down gaze, eyelid swelling, chemosis, pain, chronic conjunctival hyperemia, and decreased vision. If there is any question about the stability of disease, the patient should be evaluated by their primary physician and an ophthalmologist prior to any surgery. Surgeons should be aware that there are more risks, variability, swelling, and bleeding in patients with thyroid orbitopathy.

Amyloidosis can be systemic or localized as well as primary or secondary to other causes. Any ocular, adnexal, and orbital structure can be involved, but the most typical clinical presentation of adnexal disease is ptosis. The ptosis and ophthalmoplegia are secondary to infiltration of extraocular and levator muscles.<sup>19-21</sup> Eyelid and conjunctival nodules are another manifestation. There are many serious systemic associations, so biopsy for diagnostic confirmation is important.

Orbital and adnexal lymphomas have varied presentations but often manifest as upper eyelid fullness, blepharoptosis, proptosis, lacrimal gland enlargement, and conjunctival masses. They can present before any known systemic disease and be either unilateral or bilateral. A salmon-colored mass in the conjunctival fornix is highly suggestive of a lymphoma and should be biopsied by an ophthalmologist.

Sarcoidosis is a well-known systemic inflammatory disease. Pertinent adnexal findings include eyelid nodules, lacrimal gland enlargement, dry eye syndrome, and proptosis. Any suspicion should merit further workup prior to elective eyelid or periorbital surgery on the face. Other systemic conditions, especially those with vasculitic components, including Wegener's granulomatosis, systemic lupus erythematosus, rosacea, polyarteritis nodosa, rheumatoid arthritis, and relapsing polychondritis, are at risk for peripheral corneal ulcers and scleritis if the eye becomes inflamed or excessively dry following eyelid surgeries.

Systemic lupus erythematosus also may have disc-shaped erythematous, scaling lesions that can spread, leaving scarring and atrophy. As with other systemic inflammatory disorders with cutaneous manifestations, these patients can be at greater risk for scarring and

dyschromia following laser resurfacing or chemical peeling. Periorbital atopic dermatitis, similar to perioral dermatitis, can be a problem following excessive eyelid rubbing or inflammation following surgery manifesting as lichenification of the skin, postinflammatory hyperpigmentation, and leatherlike textural changes.

Scleroderma has multiple ophthalmic manifestations. Pertinent to this discussion are dry eyes, conjunctival scarring and forniceal foreshortening, periorbital edema, fibrotic "woody" eyelids, and exposure keratitis. Therefore, scleroderma patients should only undergo elective eyelid surgery very cautiously.

## CONCLUSION

Proper preoperative assessment of the eye and periorbital region is essential to protect ocular health and vision and to optimize the surgical outcome. In today's medicolegal climate, it is imperative to identify not only underlying ocular conditions but also potentially serious systemic conditions with ocular manifestations that can impact the patient's overall health. A thorough ocular history and exam by a qualified provider is needed if there is any question regarding the presence of any condition that can impact the surgical success or the health of the eye.

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