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Optimizing Cataract Outcomes

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"Refractive IOLs offer many advantages: They are more stable than any surface procedure, provide better visual optics than surface procedures, and offer the real ability to correct presbyopia."

Eric Donnenfeld, M.D.

Optimizing Cataract and Refractive Outcomes: Maximizing IOL Technology

by Eric Donnenfeld, M.D.

These refractive IOLs offer many advantages: They are more stable than any surface procedure, provide better visual optics than surface procedures, and offer the real ability to correct presbyopia. But they also have serious downsides: Patients often complain of glare, halo, and loss of contrast sensitivity. I consider them a high-wire act—when things go smoothly, they are great, but everything has to be perfect.

There is a variety of treatable causes of glare, halo, and loss of contrast sensitivity. Dry eye is a common and easily treatable cause. This can be detected easily with standard evaluations such as lissamine green staining and/or Schirmer testing. Copious lubrication pre-operatively and post-operatively is essential to optimize visual outcomes.

Another potential cause of these troublesome symptoms is posterior capsule opacification. An important clinical pearl is that capsules implanted with multifocal IOLs often do not look hazy, but even a small amount of fibrosis often can reduce vision. This reduction might be subtle and not manifest on the Snellen chart, but the patient may report that things just don't look quite as clear or as bright as they previously looked.

This problem is cured easily with the YAG laser. We also must include cystoid macular edema (CME) on this list. Once dubbed sub-clinical, CME has been made clinically relevant by the improvements in IOL technology and the evolution of phacoemulsification techniques. In my opinion, within six months, the use of a non-steroidal anti-inflammatory drug (NSAID) on every cataract case—especially if a multifocal IOL is implanted—will be the standard of care.

There are a few myths that have surfaced regarding refractive IOLs. One such myth is that patients gratefully will tolerate small errors in visual acuity after a refractive lens if it means they do not need glasses for distance or near vision. This is untrue. Today's cataract patients are demanding and do not tolerate anything less than perfect.

If you are considering becoming a refractive cataract surgeon, you have to be willing and able to treat these small refractive errors or your practice will not succeed. You must be willing to perform surface procedures for small refractive errors.

Another myth is that CME is not common. CME is actually incredibly common. Studies suggest that more than 20% of patients who have routine cataract surgery and are prescribed post-operative prednisolone acetate alone will have ocu-

Technological advances have made possible consistent excellent visual acuity outcomes following cataract surgery. New phacoemulsification techniques, multifocal IOL implants, and better peri-operative medications to speed healing and reduce complications have all contributed to the unequalled success of modern cataract extraction.

In this monograph, we will discuss the various multifocal lenses, with emphasis on their similarities and differences. We also will review data that are helping define the roles of new antibiotics and non-steroidal anti-inflammatory drugs (NSAIDs) in preventing post-operative inflammation, pain, cystoid macular edema (CME), and infection.

In addition, we will cover surgical techniques to overcome common challenging scenarios in phacoemulsification such as small pupils and hard nuclei and review surgical techniques to address astigmatism during cataract surgery.

IOL technology has advanced tremendously in the last few years. Consider the routine aphakic outcomes of just a few decades ago. Now we have multifocal and accommodative IOLs to correct presbyopia and phakic IOLs that can be implanted as pure refractive procedures.

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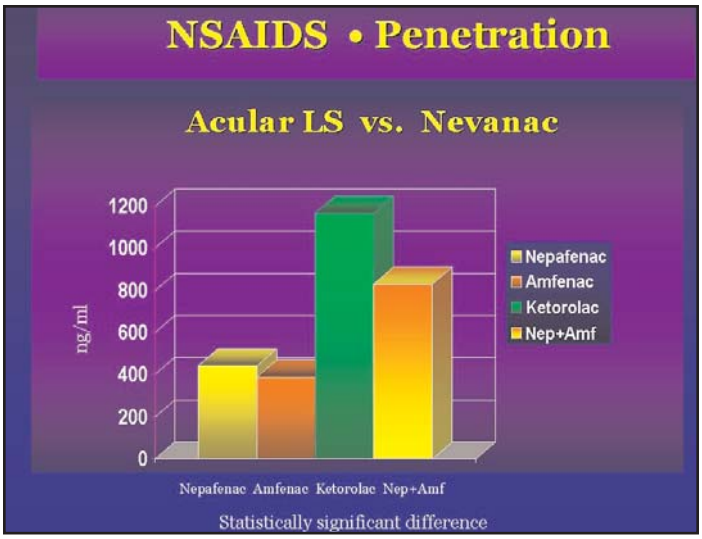

Figure 1

lar coherence tomography (OCT)–proven macula thickening.[1]

It is particularly important to prevent CME in eyes receiving multifocal IOLs. These lenses already cause a small reduction in contrast sensitivity. If you superimpose CME on top of that, the reduction in contrast sensitivity is significant, and the patient will be unhappy.

The way to prevent CME is with the use of a topical NSAID.[2] Using an NSAID reduces foveal thickening, improves post-operative visual acuity, and provides greater patient satisfaction, especially among patients receiving a multifocal IOL. There is a lot of noise in the marketplace regarding which NSAIDs are the best in terms of ocular penetration. Unfortunately, there is little comparative data to show which NSAID gets into the eye the best.

Frank Bucci Jr. (M.D., medical director, Bucci Laser Vision Institute, Wilkes-Barre, Pa.) recently presented a study looking at the relative penetration of Acular LS (ketorolac, Allergan, Irvine, Calif.) and Nevanac (nepafenac) in eyes undergoing elective cataract surgery.[3] Patients received one of these two NSAIDs four times a day for two days before surgery and received four drops 90 minutes before surgery on the day of surgery.

Aqueous samples were drawn at the start of each case and sent to the lab for a series of assays—all samples were blindly assayed for concentration of ketorolac (Allergan), nepafenac, amfenac (the active metabolite of the prodrug nepafenac) and prostaglandin E_2 (PGE_2), a potent mediator of post-operative inflammation and pain.

He reported that ketorolac reached an aqueous concentration of 1079 ng/mL compared with 588 ng/mL for nepafenac and 365 ng/mL for amfenac (Figure 1). Ketorolac achieved three times higher concentration in aqueous than the active metabolite of the nepafenac prodrug.

For the PGE_2 test, the assay only can detect PGE_2 if the concentration is higher than 99 pg/mL. In Dr. Bucci's study, 61.9% of ketorolac-treated eye versus only 17.5% of nepafenac-treated eyes had PGE_2 levels below this limit of detection.

This is the first head-to-head comparison of ketorolac and the newer NSAIDs of which I am aware. More will certainly emerge and will provide us with the data we need to select the optimal NSAID for CME prophylaxis in the cataract peri-operative period.

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Maximizing Visual Outcomes: Management of Ocular Surface Disease

by Edward J. Holland, M.D.

A healthy ocular surface is fundamental to optimizing visual outcomes after cataract and refractive surgery. Post-operative consequences of an abnormal ocular surface can include LASIK flap necrosis, epithelial in-growth, corneal scarring or melting, higher risk of infections, and reduction in best-corrected visual acuity (BCVA). Preventing these potential sequelae requires attention to the ocular surface before, during, and after surgery.

The best way to avoid surface-related complications is to identify and treat ocular surface disease before surgery. Evaluating the anatomy and function of the eyelid may provide clues that surface disease is present. Observing the blink rate and the volume and quality of the tear film is also important.

The conjunctival and corneal epithelium also may reveal abnormalities, which can be visualized after staining with rose bengal or lissamine green stains—even on eyes with normal fluorescein staining

"The best way to avoid surface-related complications is to identify and treat ocular surface disease before surgery."

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patterns. Tear production also can be assessed by Schirmer testing. All of these evaluations are important in diagnosing ocular surface disease and anticipating problems related to surgery.

If dry-eye syndrome is identified pre-operatively, an appropriate management plan should be initiated. Potential aggravating factors—such as smoking or habitual positioning near a forced-air vent—should be identified and eliminated. Tear replacement therapy often is adequate for mild disease.

In addition, preservation of existing tears via punctal occlusion also can be useful in reestablishing a healthy ocular surface. If any surface inflammation is present, this should be suppressed before surgery. This can be accomplished with non-steroidal anti-inflammatory drugs (NSAIDs), topical steroids, or Restasis (cyclosporine, Allergan). In fact, Restasis should perhaps be used before punctal plug placement in order to reduce inflammatory mediators in tears before prolonging contact between tears and the ocular surface.

Restasis is an anti-inflammatory agent that increases patients' tear production. In the Phase III clinical trial, on which Food and Drug Administration (FDA) approval was based,[1] corneal staining patterns improved in eyes receiving Restasis versus vehicle, with improvement seen as early as four months after beginning therapy.

In addition, blurred vision improved significantly more in Restasis-treated eyes compared with vehicle, with statistically significant improvements seen as early as one month after beginning treatment (Figure 2).

Restasis is highly effective in patients with severe dry eyes, including those with Sjögren's syndrome. But it is worth pointing out that Restasis is also highly effective in mild and moderate dry eye. In fact, perhaps because there is less underlying surface damage early in the disease process, we often see patients with mild dry eye respond to Restasis faster than patients with more severe dry eye.

Once the ocular surface is revitalized, we can proceed to surgery with confidence. If we go to surgery with an unhealthy—or even borderline—surface epithelium, there are intra-operative steps that can protect the epithelium from intra-operative trauma, including minimizing excessive irrigation and carefully avoiding any trauma to the epithelium. Additionally, it often is valuable to coat the epithelium with viscoelastic to protect it during cataract surgery.

Post-operatively, aggressive lubrication with non-preserved artificial tears can speed healing of the ocular surface. Routine post-operative medications should be kept to a minimum to spare the ocular surface exposure to drugs, preservatives, and other components of commercial drug preparations.

NSAIDs offer more benefits than risks and should be seriously considered in virtually every eye after cataract surgery. Some caution is warranted, however, in eyes at high risk for NSAID-related complications. These include eyes with post-operative epitheliopathy or epithelial defects, dry eyes, rosacea, Sjögren's syndrome, and rheumatoid arthritis.

These conditions were commonly observed in the eyes that experienced NSAID-related corneal melts a number of years ago,[2] and the publicity surrounding those melts significantly set back the routine use of NSAIDs after cataract surgery. But if you are mindful of these high-risk patients, NSAIDs can be used after cataract surgery very effectively to prevent post-operative pain, inflammation, and cystoid macular edema (CME).

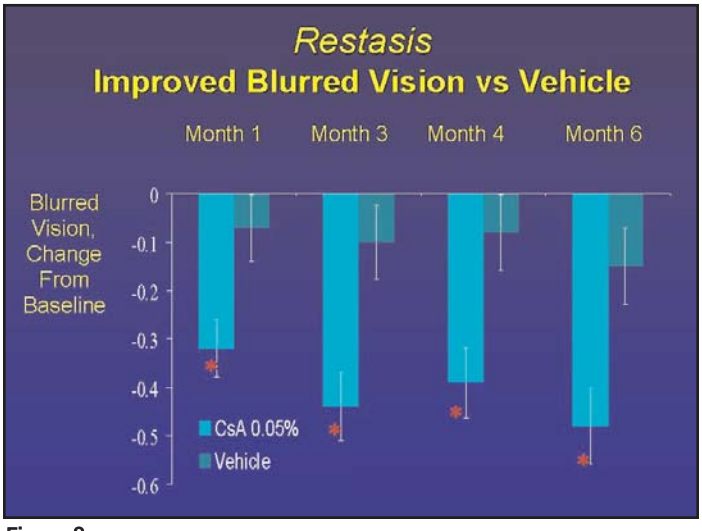

Figure 2

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"Ninety-seven percent of ReSTOR patients report never or only occasionally using glasses, and an impressive 80% to 90% of these patients report never using any glasses at all after surgery."

Kerry Solomon, M.D.

Differences in Multifocal IOLs

by Kerry Solomon, M.D.

As the baby-boomer generation reaches the cataract age, we are seeing a significant rise in the number of cataract surgeries that we perform. This is a generation of people that has come through the liposuction age, the LASIK age, and the Botox age.

These people are accustomed to surgical fixes for cosmetic issues. Presbyopia will be no exception. The baby boomers will want us to cure their presbyopia at the time of their cataract surgery.

What constitutes a cure? Do we need J1 vision at near? Newspaper headlines are J16 (Figure 3). Subtitles under the headlines are J10. Typical newsprint is J5; stock quotes are J3. You do not need to achieve J1 to comfortably read the newspaper.

We have many options for the surgical correction of presbyopia. Scleral expansion bands were an early surgical option. In this procedure, polymethylmethacrylate (PMMA) bands are inserted into scleral tunnels overlying the ciliary body in order to introduce greater spacing between the sclera and the lens.

But this procedure has not panned out. Patients often achieve decent near vision in terms of reading single letters on the eye chart, but this does not translate into an ability to read text smoothly.

The modern surgical approach to presbyopia correction is a multifocal or an accommodative IOL. There are several worth discussing, the first of which is the Crystalens, an accommodative IOL, a modified a plate haptic IOL with hinges across the plates. Its exact mechanism of action has not been fully elucidated, but it is designed to move back and forth along the visual axis in response to relative pressure changes in the anterior and posterior segments.

This lens is approved by the Food and Drug Administration (FDA) for use in the United States. Surgeons using this lens report that it provides pretty good intermediate and distance vision but is not quite as strong when it comes to near-vision testing. This has been confirmed in FDA data.[1]

In terms of patient functioning, nearly 75% of patients with bilateral Crystalens implants report using reading glasses rarely or never after surgery. However, only 25% of patients are completely free from using spectacles (spectacle independence). Other accommodative lenses are in development, including the 1 CU and the Synchrony dual-optic IOL, neither of which is currently FDA approved.

There are several multifocal IOL technologies. The ReZoom lens is an acrylic lens that incorporates balanced view optics technology. The lens consists of several alternating concentric bands of distance-dominated and near-dominated focal zones. This design aims to provide good depth of focus in a variety of bright-light and low-light situations based on pupil size.

An aspheric transition between zones provides intermediate vision regardless of pupil size/light intensity. Most ReZoom patients have excellent distance vision and intermediate vision, and the vast majority has excellent near vision as well.[2] More than 90% of patients have uncorrected distance acuity of 20/40 or better, and nearly 90% have J3 or better near vision. Overall, 92% of ReZoom patients report using reading glasses never or only occasionally.

The ReStor multifocal IOL combines diffractive

Figure 3

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Preventing Endophthalmitis

by John Wittpenn, M.D.

The single-best management of endophthalmitis is prevention. We all are familiar with the appropriate preventive strategies in the peri-operative period. Pre-operative antibiotics can reduce the microbial levels on the ocular surface, taping the lashes out of the surgical field can prevent intra-operative contamination, and, perhaps most importantly, the use of a 5% povidone-iodine solution can render the surgical field sterile at the beginning of the case.

Numerous studies have documented the reduction in endophthalmitis with povidone-iodine, and a recent evidence-based analysis identified povidone-iodine as the highest-ranking preventive measure available.[1]

The 1990s saw an increasing incidence of endophthalmitis, due in part to the transition to clear cornea incision[2] and the growing resistance of infectious organisms to the third-generation fluoroquinolones. By 2001, virtually all infectious agents isolated from eyes with endophthalmitis were resistant to standard prophylactic antibiotic therapy.[3]

Fortunately, this was when fourth-generation fluoroquinolones emerged. These agents were far more efficacious against the organisms of concern in ocular infections. They had better penetration into the ocular tissues and had lower minimum inhibitory concentrations (MICs), which translate into better efficacy.

In a study conducted by investigators from Charles Campbell Laboratory, University of Pittsburgh, Pa., these lower MICs were demonstrated for both Staph aureus and coagulase-negative Staph species.[4] Also, in a study we reported at the American Academy of Ophthalmology (AAO) meeting, we demonstrated that the intracorneal concentration of gatifloxacin[5] far exceeds the MIC required to kill 90% of organisms.[6] This is important because the Centers for Disease Control (CDC), Atlanta, has issued a recommendation that antibiotics should be present in the tissue prior to the incision for any surgery.

In cataract surgery, the relevant tissue is the cornea, and these drugs do get into the cornea more than adequately. In addition, numerous studies have demonstrated that both gatifloxacin (Zymar, Allergan) and moxifloxacin (Vigamox) achieve aqueous concentrations higher than the MIC_{90} levels for organisms commonly implicated in ocular infections.[7,8,9,10]

It is worth pointing out that the commercial preparations of topical ophthalmic antibiotics contain more than just the active ingredient. The commercial preparation of gatifloxacin is preserved with benzalkonium chloride (BAK). In a study presented at Association for Research and Vision in Ophthalmology (ARVO) in 2005, the MICs for gatifloxacin against various organisms were significantly lower in the presence of BAK compared with gatifloxacin alone.[11] Thus, there appears to be a synergistic interaction between gatifloxacin and BAK (Figure 4).

This observation was underscored by a study presented at the most recent ARVO meeting. The MIC_{90}s of both the gatifloxacin and moxifloxacin molecules and their commercial ophthalmic solutions were determined in vitro against several common clinical microbial isolates.[12]

The isolated molecules of both drugs had similar MIC_{90}s to one another; but the commercial preparation of gatifloxacin, which is preserved with BAK, had significantly lower MIC_{90}s than the commercial preparation of moxifloxacin, which does not contain BAK. This difference was particularly striking against methicillin-resistant Staph aureus.

There may be other important differences between the two fourth-

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and refractive technology to provide depth of focus. The lens features a central 3.6-mm apodized diffractive optical zone with 12 concentric, gradually decreasing step heights designed to provide adequate light at near and distance focal points independent of lighting conditions.

Surrounding this central zone is a traditional refractive zone for distance vision. Clinical results reveal that 88% of bilaterally implanted patients achieve 20/25 or better uncorrected distance acuity, and 74% achieve similar acuity at near. Ninety-seven percent of ReSTOR patients report never or only occasionally using glasses, and an impressive 80% to 90% of these patients report never using any glasses at all after surgery (spectacle independence).[3]

There is an important point to be made for surgeons who want to incorporate surgical presbyopia correction into their practices. You have to approach these patients as refractive patients as much as cataract patients. If we are going to make these lenses successful in our practice, we have to have realistic goals and expectations, not only for the patients but for ourselves. We have to be comfortable dealing with challenging patients.

As a refractive surgeon, I am comfortable if I have a 6% enhancement rate. As a cataract surgeon, there is traditionally a zero tolerance for missing the mark refractively with regard to enhancements. In order to have successful outcomes, you have to adopt a refractive surgical mentality for your practice because presbyopic IOL patients have higher expectations.

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"While post-operative bacterial endophthalmitis may be on the rise, we have better drugs today to prevent endophthalmitis than we had 10 years ago."

John R. Wittpenn, M.D.

generation fluoroquinolones. Data presented at the 2005 meeting of the Ocular Microbiology and Immunology Group (OMIG) demonstrated a four-fold faster Staph aureus kill rate for gatifloxacin with BAK compared with moxifloxacin.[13] There also is preliminary data from the 2004 AAO meeting that say that moxifloxacin may slow corneal epithelial wound healing following photorefractive keratectomy (PRK) compared with gatifloxacin.[14]

While post-operative bacterial endophthalmitis may be on the rise, we have better drugs today to prevent endophthalmitis than we had 10 years ago. Future studies will help clarify the relative value of these two drugs in endophthalmitis prophylaxis.

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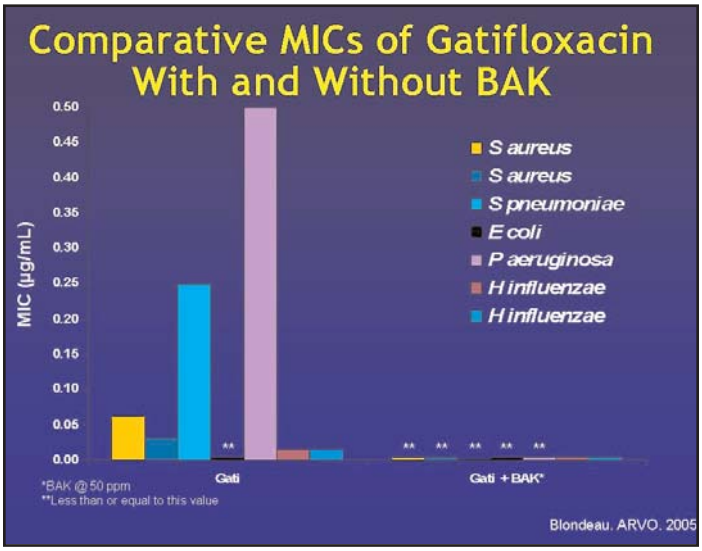

Figure 4

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Challenges in Phacoemulsification

by R. Bruce Wallace III, M.D.

"As younger patients undergo refractive lens surgery and when dealing with posterior subcapsular cataracts … use as little phaco as possible—or no phaco energy at all."

R. Bruce Wallace, M.D.

There are several common clinical scenarios that increase the complexity of phacoemulsification, including small pupils, dense nuclei, and, conversely, soft nuclei. I will share some pearls regarding my approach to these challenging cases and review techniques to minimize posterior capsular tears during phacoemulsification.

Small pupils always are going to be a challenge. I consider anything below 5 mm a small pupil. These are common in eyes with a history of iritis and in eyes that have been exposed to chronic miotic use, although miotic drops rarely are used anymore. A more commonly used drug implicated in pupil issues is Flomax (tamsulosin), which is used for benign prostatic hypertrophy that has been associated with intra-operative floppy iris syndrome (IFIS)[1] (Figure 5).

There are several options for dealing with small pupils. Using dilute epinephrine is helpful. We use epinephrine 1/10,000 by mixing 1 cc of 1/1000 epinephrine solution with 9 cc of balanced salt solution (BSS), and we inject this mixture into the anterior chamber through a 25-gauge cannula. Pre-operative use of a topic non-steroidal such Acular LS can reduce miosis during surgery.

We also employ viscoelastics to enlarge the pupil and will manually stretch pupils, if necessary. To do this, I use the Graether retractor and the Lester hook, two instruments that naturally oppose one another and give good countertraction.

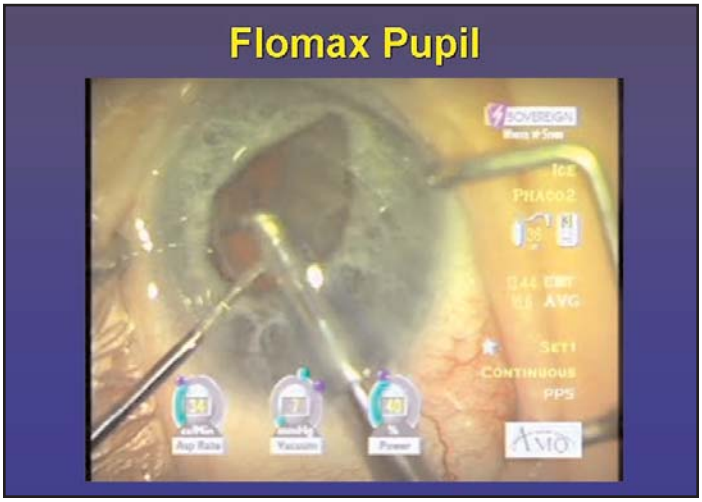

Figure 5

When it comes to dense nuclei, there are pre-operative and intra-operative considerations. Before starting the case you may want to consider a retrobulbar block and possibly intravenous sedation to put the patient at ease and facilitate what may be a longer case than usual. Using an intraocular dye such as VisionBlue (Trypan Blue), which can significantly enhance visibility of the anterior capsule during surgery, is a useful technique.

During phacoemulsification, it is often better to divide the lens into smaller pieces than we normally do with softer nuclei. I keep an instrument behind the nuclear fragments to protect the posterior capsule, and it may be wise to inject additional viscoelastic during phacoemulsification to protect the corneal endothelium. When inserting the nose cone of the IOL inserter, I like to hold the eye steady with a side-port instrument such as a blunt-tip cyclodialysis spatula—this is particularly helpful during topical cases.

As younger patients undergo refractive lens surgery and when dealing with posterior subcapsular cataracts, soft nuclei have become more of an issue for lens surgeons. In such cases, my approach is to use as little phaco as possible—or no phaco energy at all.

If the nucleus is soft enough, we often can extract the entire lens using only irrigation and aspiration. But most lenses have at least a little rigidity, and aspiration alone won't be adequate. In these cases, I take advantage of the improved fluidics of the newer-generation phaco units and use the phaco hand piece but still minimize—or entirely avoid—phaco power use. We call this quiet-time phaco, or QT phaco.

As far as capsular tears are concerned, I think the most important consideration is reducing surge as much as possible. Insert a second instrument through the side port, and techniques such as hemiflips and hydroelineation, in addition to hydrodissection, can help keep the phaco tip away from the posterior capsule.

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"LRIs offer potential advantages over AK incisions: They are less likely to cause axis shift or irregular astigmatism, and there is less likelihood for overcorrecting."

Louis D. "Skip" Nichamin, M.D.

Managing Astigmatism during Cataract Surgery

by Louis D. "Skip" Nichamin, M.D.

Cataract patients expect more from surgery today than ever before—even small degrees of cystoid macular edema (CME) are not well tolerated. In addition, patients now increasingly expect to have their refractive error corrected at the time of surgery—this, of course, includes any preexisting astigmatism. We know from our keratorefractive experience that as little as 0.75 D of residual astigmatism can be clinically bothersome to our patients.

One simple option for neutralizing astigmatism at the time of cataract surgery is altering the location of our cataract incision. Placing the incision on the steep meridian will neutralize small-to-moderate amounts of astigmatism. But this can be technically awkward if the steep axis is significantly away from your routine incision location, and repositioning yourself at the operating table is not always feasible.

We also now have two toric IOLs that are Food and Drug Administration (FDA) approved. I was fortunate to participate in a recent toric IOL study, and we found that the lens works well.[22] It is certainly an option for patients, particularly those who may have a contraindication for incisional surgery.

For most patients, I prefer peripheral relaxing incisions. Astigmatic keratotomy (AK) was first popularized in the 1980s. A more recent modification is the limbal relaxing incision (LRI), which is, in fact, not a limbal incision at the gray/blue tissue junction; it is made slightly more centrally in the peripheral cornea.

LRIs offer potential advantages over AK incisions: They are less likely to cause axis shift or irregular astigmatism, and there is less likelihood for overcorrecting. Improved stability may be because of the greater proximity of the incision to the limbus, which provides for a more controlled healing process.

LRIs are admittedly a bit less powerful than AK incisions, but in the cataract-age population we routinely get up to 3 D of correction with 90-degree incisions. We do not exceed 90 degrees of arc. Importantly, the LRI has a nearly a one-to-one coupling ratio, which means the amount of flattening we induce in the incised meridian is very close to the amount of steepening that occurs opposite. As a result, there is no shift in the spherical equivalent and no need to change your IOL power. That is not always true with more central corneal relaxing incisions.

To begin performing LRIs for your patients you will need a few things. You need to avail yourself of a nomogram to guide the incision parameters. There are several nomograms available, including two of my own, for both routine cataract and refractive lens exchange patients (Figure 6). You also may need to acquire new instrumentation, specifically markers, devices to delineate the placement and extent of the incision, and dedicated knives. Your results will be proportional to the quality of the instruments you use, especially the blade.

Of course, you also need to employ good surgical technique. Start with a fourth-generation fluoroquinolone to prevent postoperative infections. I treat my patients when they arrive at the surgery center

I prefer the Sovereign WhiteStar system because its fluidics significantly reduce surge. The new iridocorneal endothelial syndrome (ICE) upgrade helps to keep the lens material at the phaco tip with each pulse of energy, which enhances both its ability to hold and its ability to follow during phacoemulsification.

Modern techniques and technology have provided us with new ways to tackle challenging cataract surgery. With proper pre-operative planning and careful intra-operative technique, cases with small pupils and hard or soft nuclei can be performed without great difficulty, and posterior capsular tears can be avoided.

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on the day of surgery. I also place an orientation mark on the limbus while the patient is upright pre-operatively because some patients have ocular torsion when in the supine position, and precise incision placement is critical to this procedure.

Intra-operatively, the incisions are placed at the peripheral-most extent of clear corneal tissue. If pannus is present, ignore it and cut right through those small vessels. Also, it is important to hold the blade perpendicular to the cornea throughout the incision—do not aim straight down at the floor. This will prevent gaping, and you will have a more consistent depth and hence more consistent results.

I like to hold the knife with my thumb, index finger, and first finger, as though I am throwing a dart, so that as I pull the blade toward myself, I can rotate it at the same time. I use the limbus as a template and follow its curvature. You can create beautiful arcuate incisions in this fashion.

I usually place the LRIs at the start of surgery, unless the LRI corresponds to the location of the phaco incision. In that case, you risk an intra-operative wound gape from instrument manipulation, so I recommend making a short segment of the LRI superimposed upon the phaco incision at the beginning of the case. Then complete the phaco incision and cataract procedure. Then go back and complete the LRI by extending it in one or both directions, as directed by the nomogram.

It goes without saying that post-operative results will depend on accurate measurement of pre-operative astigmatism. When determining the steep meridian over which the incisions will be centered, keratometry is generally reliable, refraction can yield variable axis results due to cataract, and topography mapping may serve as the tiebreaker. Similarly, when measuring cylinder, keratometry tends to underestimate the magnitude of cylinder, refraction is variable due to cataract, and, again, the topographical map can be used as the tiebreaker.

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NOMOGRAM
FOR
CLEAR CORNEAL PHACO SURGERY

Louis D. "Skip" Nichamin, M.D.
Laurel Eye Clinic, Brookville, PA

♦ **ASTIGMATIC STATUS = "SPHERICAL":** (+0.75 X 90 ⟷ +0.50 X 180)

Incision Design *= "Neutral" temporal clear corneal incision (3.5 mm. or less, single plane, just anterior to vascular arcade)*

♦ **ASTIGMATIC STATUS = "AGAINST-THE-RULE":** Steep Axis 0-30°/ 150-180°):
Intraoperative keratoscopy determines exact incision location

PRE-OP CYLINDER		30-40 yo	41-50 yo	51-60 yo	61-70 yo	71-80 yo	81-90 yo	>90
+0.75 → +1.25	nasal limbal arc only						35°	
	*paired limbal arcs on steep axis	55°	50°	45°	40°	35°		
+1.50 → +2.00	*paired limbal arcs on steep axis	70°	65°	60°	55°	45°	40°	35°
+2.25 → +2.75	*paired limbal arcs on steep axis	90°	80°	70°	60°	50°	45°	40°
+3.00 → +3.75	*paired limbal arcs on steep axis	↓ o.z. to 8 mm 90°	↓ o.z. to 8 mm 90°	85°	70°	60°	50°	45°
		degrees of arc to be incised						

**The temporal incision is made by first creating a two-plane, grooved phaco incision (600μ depth), which is then extended to the appropriate arc length at the conclusion of surgery.*

Figure 6

"NSAIDs can prevent CME and thus improve post-operative visual acuity and contrast sensitivity."

Calvin W. Roberts, M.D.

Using NSAIDs to Maximize Surgical Outcomes

by Calvin W. Roberts, M.D.

We have discussed the importance of preventing cystoid macular edema (CME), especially in eyes receiving a multifocal IOL, in order to maximize contrast sensitivity. Contrast sensitivity may not always get the respect it deserves. If we think of Snellen acuity as a measure of quantity of vision, then I suggest we think of contrast sensitivity as a measure of quality of vision. Non-steroidal anti-inflammatry drugs (NSAIDs) can prevent CME, and thus improve post-operative visual acuity and contrast sensitivity.

We performed a study of 200 patients undergoing elective cataract surgery.[1] Patients were randomly assigned to one of two pharmaceutical treatment regimens. One group received ketorolac and gatifloxacin four times daily for three days pre-operatively and gatifloxacin, ketorolac, and prednisolone four times daily for one week post-operatively. These patients then stopped gatifloxacin but continued ketorolac and prednisolone twice daily for an additional three weeks. A second group received identical treatment with gatifloxacin and prednisolone but did not receive ketorolac.

Our endpoints were Snellen acuity, contrast sensitivity using the Functional Acuity Contrast Test, and change from pre-operative baseline in macular thickness by ocular coherence tomography (OCT), all determined four weeks after surgery.

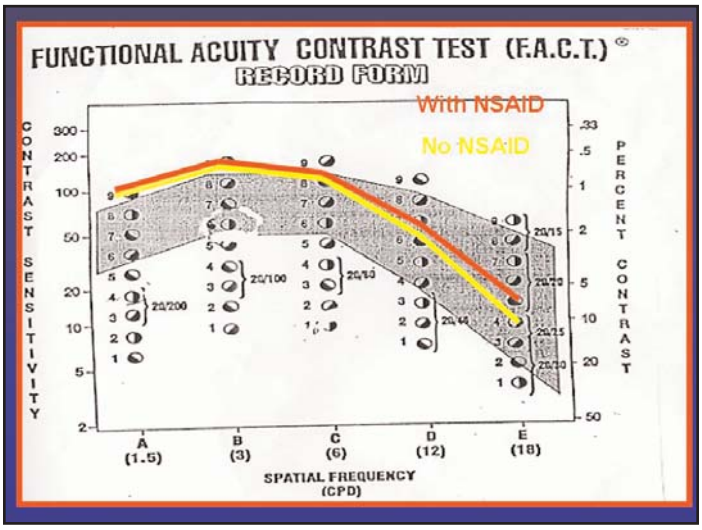

Figure 7

We found that the patients who received non-steroidals had less change in macular thickness (a mean of 4.2 microns of thickening) than those who did not receive non-steroidals (10.2 microns). Both groups had the same mean post-operative Snellen acuity, but the patients who received non-steroidals had better contrast sensitivity than the group that did not receive non-steroidals (Figure 7). This difference in contrast sensitivity was greatest at the higher spatial frequency, at the greatest level of fine contrast.

We concluded that patients who use pre-operative and post-operative non-steroidals had less post-operative increase in macular thickness, and this change in macular thickness correlated with the change in contrast sensitivity. It is worth pointing out that this was a small difference in macular thickness, but it still manifested as a clinical difference in contrast sensitivity. The key lessons here are that Snellen acuity is not a sensitive measure of mild macular edema and that the routine use of a non-steroidal benefits every patient undergoing cataract surgery.

References

1. Quality of vision after cataract surgery with non-steroidals. ASCRS•ASOA Symposium & Congress, 2006

Conclusion

We have reviewed the current and emerging drugs and technologies that allow us to provide unrivaled visual acuity outcomes after cataract and refractive surgery. From non-steroidal anti-inflammatory drugs (NSAIDs) and antibiotics to new lenses and new techniques, our patients have more exciting options to choose from than ever before.

Cataract, presbyopia, and astigmatism can all be surgically corrected with results that now consistently approach perfection. As existing technologies improve and new ideas evolve, the outlook for patients with cataract and refractive errors has never looked more promising.

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1. Which of the following are commonly associated with refractive intraocular lenses (IOLs)?

- ❑ a. Halos
- ❑ b. Glare
- ❑ c. Both a and b

2. Which of the following is true regarding cystoid macular edema (CME) following cataract surgery?

- ❑ a. It is uncommon, with less than a 5% incidence of ocular coherence topography (OCT)-proven CME
- ❑ b. Non-steroidal anti-inflammatory drugs (NSAIDs) effectively prevent and treat CME
- ❑ c. Both a and b

3. Which of the following is true regarding refractive surgery and ocular surface disease?

- ❑ a. Ocular surface disease is best addressed in the post-operative period following refractive surgery
- ❑ b. Restasis can effectively improve the ocular surface prior to refractive surgery
- ❑ c. Both a and b

4. Which of the following is true regarding post-surgical endophthalmitis?

- ❑ a. Prepping with povidone-iodine is ineffective for prophylaxis
- ❑ b. Fourth-generation fluoroquinolones such as gatifloxacin and moxifloxacin attain intraocular levels high enough to kill typical pathogens
- ❑ c. Both a and b

5. Which of the following are options for the management of astigmatism at the time of cataract surgery?

- ❑ a. Toric IOL implants
- ❑ b. Limbal relaxing incisions
- ❑ c. Both a and b

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