

6th Annual San Francisco Cornea, Cataract, and Refractive Surgery Symposium Highlights

Once again, the Symposium this year featured renowned speakers, up-to-date topics, and the latest management pearls in the rapidly evolving field of cornea, cataract and refractive surgery. The venue at the Ritz Carlton was enjoyable and the attendance was at record high. As always, the clinical presentations were followed by an entertaining talk on practice management. We are pleased to present the clinical highlights.



Dry Eye Management -- William Trattler, M.D., Miami, FL

Patients that experience dryness after LASIK, PRK, and cataract surgery can be helped once the underlying causes are understood. These causes are often multifactorial. They involve – pre-existing dryness, certain medications such as oral antihistamines and anti-depressants, transiently reduced corneal sensitivity, and transiently reduced goblet cell density.

Pre-existing dryness is ruled out at consultation with tear break up times and Schirmer tests. If approved by the primary care physician, dryness-causing medications are discontinued. Contact lenses are discontinued as well and lubricating drops are initiated. Oral omega-3 and omega-6 fatty acids may be initiated. Significant blepharitis is addressed. Patients with documented low tear film production may benefit from Restasis started preoperatively and continued after the procedure.

The data on the efficacy of Restasis to reduce dry eye after LASIK in patients with normal tear film is controversial. Studies performed in patients undergoing LASIK with mechanical microkeratome show Restasis to be beneficial. Patients who undergo LASIK with IntraLase, however, do not benefit from postoperative Restasis, perhaps due to significantly lower incidence of dry eyes after IntraLase LASIK.

How long does it take for the corneal sensitivity to recover after LASIK? It depends. The recovery depends on the thickness of the flap, the depth of ablation, and the location of the hinge. Thinner flaps recover faster. The location of the hinge may matter more in thicker flaps and may not be as relevant in thinner flaps. On the average, it takes 6 months for the corneal sensitivity to recover after LASIK. It takes 3 months for PRK.

The likelihood of regression is greater in patients with dry eyes. However, the dryness typically does not recur as much after enhancement as the patient may have experienced after the primary procedure.

If patient reports symptoms of dryness after laser vision correction, we need to distinguish dryness from allergies. Patients with allergies report itching. They should be treated with anti-allergy medications, including steroids, and should be discouraged from eye rubbing. Eye rubbing in patients with allergies may be associated with keratoconus.

Patients undergoing cataract surgery may also experience the symptoms of dryness. In many patients this could be due to either pre-existing dryness or toxicity from the peri-operative medications.

Treating dryness can help both refractive and cataract patients achieve optimal results. ■



The Role of Cornea in Diagnosis and Management of Glaucoma and Glaucoma Suspects

-- Andrew G. Iwach, M.D.,
San Francisco, CA

Ocular Hypertension Treatment or OHT study has shown that eyes treated for increased ocular pressure have lower incidence of developing glaucoma. The study also addressed the importance of corneal thickness in accurately assessing intraocular pressure.

Continued with The Role of Cornea on page 2

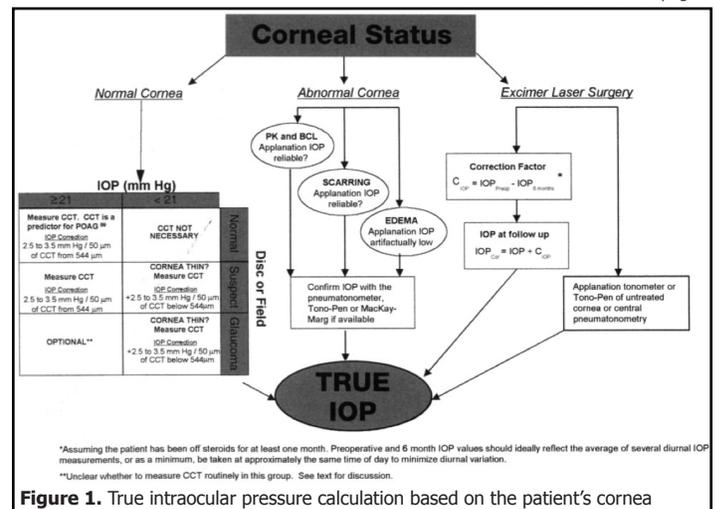


Figure 1. True intraocular pressure calculation based on the patient's cornea

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Open angle glaucoma has multiple risk factors. To accurately predict the probability of a patient developing glaucoma, “risk factor calculators” have been developed. Devers Eye Institute developed one of the more commonly used calculators. (<http://www.discoveriesinsight.org/CalculatorForm.htm>). It takes into account such variables as age, IOP, corneal thickness, vertical C/D ratio, visual field pattern standard deviation, and diabetes. Each category has a range of values that are added up to give a point total that relates to the percentage risk of developing glaucoma within five years. Corneal thickness is important and should be considered together with other risk factors in determining who needs to be treated and who can simply be observed.

Risk factor calculator is a useful reminder that the risk factors for progression of many common diseases such as coronary heart disease, cancer, diabetes, macular degeneration, and glaucoma, for example, are often multifactorial. The statistics give us a general population trend only. We still must analyze each patient individually. For example, in the OHT study, the treated group show lower progression to glaucoma by 10%, but 90% of the untreated group still did not progress. This means that some people who we may think will progress don't and some who we don't think will progress do. All the risk factors need to be assessed for each patient to determine if they need to be treated.

In measuring IOP, we need to keep in mind that corneal thickness can affect the reading (Figure 1). Newer instruments, such as dynamic contour tonometry, for example, are being developed to enhance our accuracy in measuring the IOP.

Patients treated with glaucoma medications may develop adverse corneal surface reactions, especially related to the traditional preservatives, such as BAK, for example. Newer medications contain milder preservatives, such as sozia, for example, to lessen the impact on the ocular surface. ■



Corneal Screening and Analysis for Refractive and Cataract Surgery

-- Marc Michelson, M.D.,
Birmingham, AL

The Oculus Pentacam is a 3-D anterior chamber analyzer that measures the cornea more extensively than ever possible in the past. We can analyze elevation, slope, curvature, and a newer concept, first surface aberrations. The Pentacam shows optical based pachymetry, anterior and posterior topography and elevation maps, surface aberrations, anterior chamber depth maps, cataract analysis, Holladay reports (for accurate intraocular lens power calculation), and tomography. The depth of focus is achieved by scheinplflug imaging - where the film plane, lens plane, and subject plane all intersect. The scan is captured by a rotating camera located at the periphery of the cornea, rather than in the center. The camera does not block the central cornea and it captures limbus to limbus pictures 360 degrees around creating over 20,000 points of data, including accurate measurements of the central cornea.

Elevation data compares the patient's cornea to the best fit sphere. The difference between the anterior or posterior corneal surface and the best fit sphere creates the elevation map. The best fit sphere is floated with the cornea making points above the best fit sphere plus

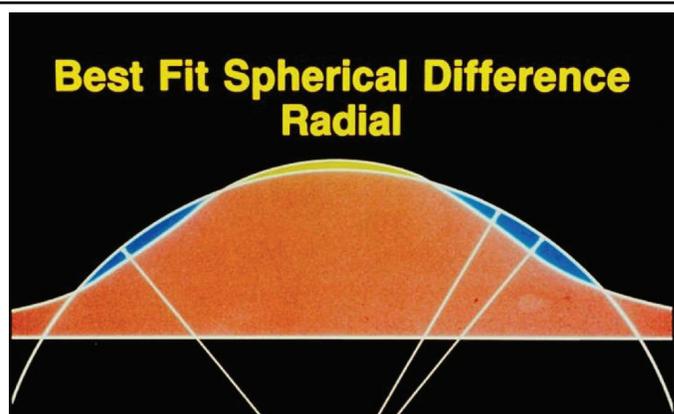


Figure 4. On the Pentacam scan, corneal points above the sphere are plus values and below are minus values.

values and below negative values. Maximum anterior elevations less than $+12\mu\text{m}$ are considered normal, maximum anterior elevations greater than $+15\mu\text{m}$ may indicate keratoconus, maximum anterior elevation differences between $+12\mu\text{m}$ to $+15\mu\text{m}$ are the “grey zone”. Maximum posterior elevations of $+20\mu\text{m}$ or higher may be indicative of keratoconus,

Pentacam also allows us to locate corneal apex in relation to the thinnest pachymetry point. If the thinnest pachymetry point is significantly below the apex, the cornea may be suspicious for keratoconus.

Placedo-disc based topography uses slope data whereas the Pentacam uses elevation data to analyze the cornea. Computing curvature and elevation based on slope can create inaccurate data because of several assumptions about the structure of the cornea. Topography assumes that the normal of the videokeratoscope to the cornea, the line of sight, and the corneal apex are all in line with each other. But if the cornea is asymmetric, such as in keratoconus, for example, this assumption isn't true. A map with false data is created that may not expose the abnormality of the cornea. Using elevation data across the entire cornea yields a representation of its true shape because the data is independent of axis, orientation, and positioning.

The Pentacam also gives us something new called corneal variance indexes. The Index of Surface Variation is the value of curvature variation from the mean curvature. The Index of Vertical Asymmetry compares the curvature of the upper and lower areas. It shows a Keratoconus Index and Center Keratoconus Index. The Index of Height Asymmetry also compares the upper and lower height values and the Index of Height Decentration shows the decentration data in the vertical direction. The Minimal Sagittal Curvature shows the steepest part of the cornea. It also shows the Aberration Coefficient using Zernike Analysis of the front of the cornea which, unlike the wavefront aberrometer, includes only cornea and not the crystalline lens. ■



PRK 2007 – New topical analgesic

-- Ella G. Faktorovich, M.D.,
San Francisco, CA

PRK remains an excellent option for patients who are not good candidates for LASIK. Patients with thin corneas, irregular corneas, and certain corneal conditions, such as epithelial basement membrane dystrophy, benefit from PRK with excellent results.

Review of published studies comparing uncorrected visual acuity after LASIK vs. PRK reveal that six months after their procedure, the percent of patients seeing as well after PRK as they do after LASIK is the same, regardless of the myopia treated. Patients with myopia of -5.0D or less, achieve great uncorrected vision even earlier – at three months postop.

Comfort management after PRK is limited to systemic medications, topical NSAIDs, and topical anesthetics. Systemic medications may result in systemic side effects. Even the newer versions of topical NSAIDs have been associated with corneal infiltrates, inflammation, and delayed re-epithelialization. Topical anesthet-

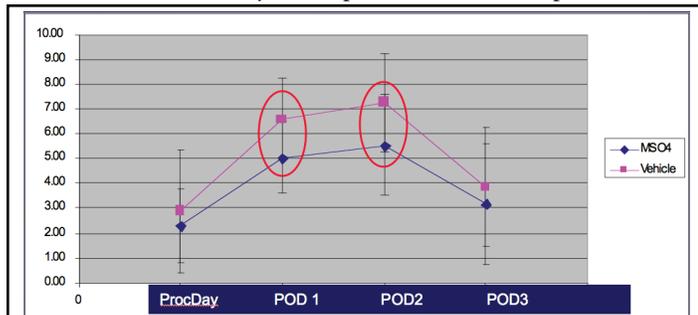


Figure 2. Topical 0.5% MSO4 is effective in reducing the postoperative discomfort after PRK. The graph shows maximum pain scores recorded by patients in the PVI study on postoperative pain assessment questionnaires administered every 2 hours after PRK. The data will be presented at the 2007 ASCRS meeting in San Diego.

ics, even diluted versions, can still delay corneal re-epithelialization. Anesthetics such as Proparacaine, Tetracaine, Lidocaine, etc, work by blocking sodium/potassium channels on the nerve cells to reduce the impulse propagation. Unfortunately, these channels are also present on the epithelial cells, especially the actively replicating epithelium that's trying to heal the epithelial defect. That's how topical anesthetics slow down corneal epithelial healing.

At PVI, we have been studying an alternative topical pain-reliever – dilute topical opiate. Topical opiates bind to unique opiate receptor present on nerve cells only. Significant data has been published on the efficacy of topical and intra-articular morphine in pain control for patients with arthritis and after arthroscopic surgery. The effect has been shown to be entirely local without systemic penetration.

We have conducted a double-blind, prospective, randomized study of topical 0.5% MSO4 after PRK. Twenty patients received the medication and twenty received vehicle control. The drops were administered 4 times a day for the first 4 days after PRK. Patients were asked to fill out pain assessment questionnaires every 2 hours while awake for the first 4 days after the procedure. Patients were examined daily. The size of their epithelial defect was measured and the cornea monitored for side effects.

The analgesic effect was significant at one- and two-days postoperatively. There was no difference at all on the epithelial healing and no adverse reactions were observed. The data will be presented at the 2007 ASCRS meeting in San Diego.

We believe that this novel application of topical opiates ushers in a new era of topical ophthalmic analgesia for safe and effective pain control, not only after PRK, but also in corneal abrasions, keratopathy, ulcers, and ophthalmic surgery.

Further studies are planned to study the efficacy of topical MSO4 in different concentrations, in combination with other analgesics, and studies to demonstrate opiate binding to the peripheral nerve receptors in the cornea. ■



Presbyopic IOL's What, When, Why?

-- Steve H. Chang, M.D.,
Beverly Hills, CA

Why do we consider presbyopic IOLs? Thirty-three percent of patients between the ages of 45-64 are developing cataracts. These are younger, more active people who demand great results.

Currently three presbyopic lenses are FDA approved. ReZoom is the refractive multifocal. ReSTOR is a diffractive multifocal. Crystalens is the accommodative IOL. The ideal presbyopic lens would have 100% light distribution to each of near, intermediate, and distance with no light loss. Each current lens has advantages and disadvantages. Therefore, we need to understand each patient's lifestyle and preferences to recommend the best lens for them.

ReZoom is a distance dominant, multi-zonal, multi-focal lens which includes a central distance zone for bright light, a near zone for moderate to low light, and the transition zone that creates intermediate vision. This means that outside in bright light you get 83% of light for distance, but only 4% for near due to the small pupil. In lower light, such as in a dim restaurant, the pupil gets larger and near light becomes 30% while distance is still at 60% which is acceptable vision for both. This lens gives the near vision with an affective add of 2.60D. Therefore, it is best for patients who want distance – intermediate vision combination.



Figure 3. Three most commonly used designs of presbyopia-correcting IOLs

The ReSTOR lens uses apodized diffractive optics in the central zone with a peripheral zone of distance refractive optics. This is a near dominant lens with an affective add of 3.20D. In bright conditions, light is more equally distributed between near and distance which is good for reading, but not as good for distance acuity. There is also a 20% loss of light. In dim conditions, the distance is good, but the near only gets 10% of light. In any situation, no light is used for intermediate which makes this lens not ideal for computer users. This lens is a good choice for patients who want distance – near vision combination.

The Crystalens works by the idea of pseudo-accommodation. The contraction of the ciliary muscle applies force to the peripheral vitreous which in turn displaces the central vitreous to push the crystalens forward. It uses a monocular optic with flexible hinges. It gives good distance and adequate intermediate vision, but not much near because of its 1.25D affective add. Also, not all patients respond to the

lens action. Glare and haloes are minimal and it is effective with small pupils due to the monocular optic design.

When considering patients for presbyopic IOLs consider patient's age, occupation lifestyle, ocular health, and feelings about cost. The surgical goals are 20/20 for distance, J2 for intermediate, and J1 for near with maximal contrast sensitivity, rapid recovery and stability, and long-term enhancement potential. To maximize results, IOL calculations are made using the A-scan and three types of keratometry readings, manual, topography, and Pentacam. If there is some residual astigmatism, limbal relaxing incisions can be used or a LASIK/PRK touch-up. Mixing lens designs can help functionality for near and intermediate by using ReSTOR in the near eye and ReZoom in the dominant eye. It has also shown a decrease in halos and glare perhaps because the effects of the two lenses cancel each other out. ■



Postoperative Cataract Care: Management and Complications

-- Dr. Bernard C. Tekiele, III,
Ann Arbor, MI

More and more patients are looking to get excellent vision after cataract surgery with a trend towards emmetropia and presbyopic IOLs.

The first day after surgery, we see how they are doing and review their instructions. Take off the protective shield and clean the skin of the adhesive tape well especially with older patients with sensitive skin. Measure distance VA with and without pinhole to determine both UCVA and BSCVA. Realistically, we want to see at least 20/40 or better with pinhole. Use the slit lamp to check the wound site, anterior chamber, and the placement of the implant, and also check the IOP. In the presence of decreased acuity out of proportion with the anterior chamber appearance you want to check the macula with direct ophthalmoscopy or undilated 90D.

The patient should use sunglasses outside during daylight for their comfort and sleep with the protective shield for a few nights as a precaution, although some say it isn't necessary with a no-stitch surgery. The patient can take analgesics PRN for pain and should stick to the drop regimen; prostaglandin inhibitor (Acular) to prevent CME, steroid (Pred Forte), and anti-biotics (Zymar or Vigamox) all taken qid for the first week. They should also restrict physical activity (no lifting over 20 pounds). Then, reschedule for a week.

At one-week postop, review the symptoms, check VA, pupils, IOP, and confrontational VF. A baseline refraction and K readings are especially important to do in order to select a lens for the second surgery for the fellow eye. Push plus especially for those with a Crystalens because these patients can accommodate. The shield and anti-biotic can be discontinued keeping the Pred Forte and Acular the same (usually for another 3 weeks). Patient will then need to return in 2-3 weeks.

At this point, DFE is performed to check for cystoid macular edema since this is about the time it becomes significant. Also, peripheral retina needs to be examined to rule out retinal breaks and/or detachment. A final refraction is done for spectacles if needed. Drops are discontinued and the patient should return in 6-12 months.

Early on, you may see mild corneal edema especially at the wound site. If necessary, steroids can be increased or Muro128 added. Iritis is managed with the steroid drops as indicated. If there is grade 3 cell

or more, the patient should be sent back to the surgeon immediately for evaluation to rule out endophthalmitis. The IOP may be elevated at day one and it is not unusual for it to be in the mid-20's. A patient would not be responding to the steroids at day one so just continue to watch the IOP closely or send them back to the surgeon if it is very elevated. Significantly elevated IOL probably indicates retained viscoelastic material, i.e. Healon, in the anterior chamber. This will be broken down spontaneously and IOP will return to normal in a few days. If the IOP is significantly elevated, the surgeon may consider releasing some of the fluid through the wound site at the slit lamp. Check for a wound leak with a Seidel test. If there is a leak you could see an unusually low IOP or shallow anterior chamber. These usually will seal with a pressure patch and topical antibiotics. Patients often complain of scratchiness early on if there is SPK or the odd case of a suture at the incision site. Lubricants are indicated for comfort and suture removal if exposed. There may be a remnant lens fragment in the angle which can cause KP or elevated IOP. Minor cases may be treated with a cycloplegic every 12 hours and topical steroid drops every 2 hours to qid. More serious cases may need surgical intervention.

Between 6 months to 5 years, posterior capsular opacities can develop and can be treated with a YAG capsulotomy to restore vision. A DFE must be done one month following to look for retinal detachment which is uncommon. A new floater following the YAG procedure can be caused by the resultant capsule fragments. YAG capsulotomy is typically performed earlier in patients with presbyopic IOLs because these are sensitive to small opacities in the visual axis. ■

2007 calendar of the Upcoming Events for PVI Affiliated Doctors:

04/01/07 to 05/31/07	Pentacam training workshops. By invitation only.
05/01/07 to 06/30/07	Wavelight Eximer Laser workshops. By invitation only.

Sight Gags by Scott Lee, O.D.



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