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eFocus

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Patient management pearls from the 10th Annual San Francisco Cornea, Cataract, and Refractive Surgery Symposium

This year's Symposium brought together over 150 Bay Area doctors at the Four Seasons Hotel in San Francisco to hear the latest in patient care from the world-renowned faculty. Many of the faculty are at the forefront of clinical trials and research and development of the currently hot technologies such as femtosecond lasers, collagen crosslinking, phakic IOLs, and other treatments used in eye and vision care. In this issue of eFocus, we highlight clinical pearls most relevant to managing and educating patients in a primary eye care practice.

Femtosecond laser in anterior segment surgery: past, present, and future

Perry S. Binder, M.D., Clinical Professor of Ophthalmology, UC Irvine, CA

Dr. Binder's presentation focused on history and future applications of femtosecond lasers. This information may be especially useful when educating patients who are tech savvy – which is often the case here in the Bay Area. It may also be useful in educating relatively low tech patients. The incredible evolution of safety and precision of femtosecond lasers often gives them a piece of mind.

As with many discoveries, serendipity played a role when scientists discovered that femtosecond laser can be a safe and precise tool in doing eye surgery. In the early 90's, an ophthalmology resident, Dr. Ron Kurtz, examined a retinal injury in a graduate student accidentally caused by a femtosecond laser. He noticed minimal collateral damage and realized that this opens the door to numerous potential ophthalmic applications of the laser. In 1994, Dr. Kurz met a scientist, Dr. Tibor Juhasz, at a conference where they decided to join forces to create the IntraLase. The rest, as they say, is history.

The first femtosecond laser prototype was used in 1999 for preliminary clinical trials. It was 2 kHz and took 3-5 minutes to create a LASIK flap! A lot has happened since then. The

current IntraLase iFS laser is 150 KHz and takes 10-15 seconds to create the flap. Moreover, seven different femtosecond lasers are now available (four in the US) for corneal surgery applications. Three additional femtosecond lasers are available for cataract and lens surgery.

Corneal applications of femtosecond laser

- LASIK flaps
- Channels for Intacs intracorneal ring segments
- Creation of flap + excision of corneal lenticle to correct myopia (FLEX or SMILE)
- Penetrating Keratoplasty
- Posterior Lamellar Keratoplasty (DSEK, DMEK, DALK)
- Anterior Lamellar Keratoplasty (ALK, FALK)
- Rotational Keratoplasty (**Figure 1**)
- Corneal biopsy
- Astigmatic keratotomy – unlike traditional AK or LRIs, iFS laser can create corneal incision that are fully contained within the stroma improving healing and comfort
- Corneal tattooing
- Collagen crosslinking drug delivery
- Limbal stem cell transplantation
- Pockets for corneal inlays to correct presbyopia
- IntraCor to correct presbyopia – concentric corneal rings are placed to create multifocality (**Figure 2**)

Cataract and lens applications of the laser include

- Direct ablation of the lens to increase its flexibility (Lentotomy)
- Corneal incisions – entry for IOL placement, astigmatic keratotomy
- Capsulorhexis
- Lens fragmentation

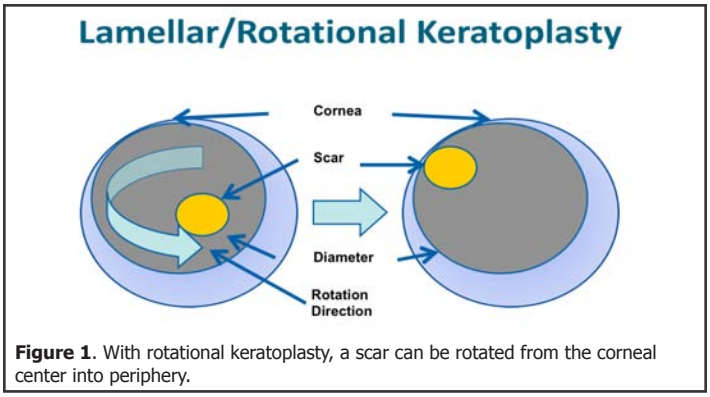

Figure 1. With rotational keratoplasty, a scar can be rotated from the corneal center into periphery.

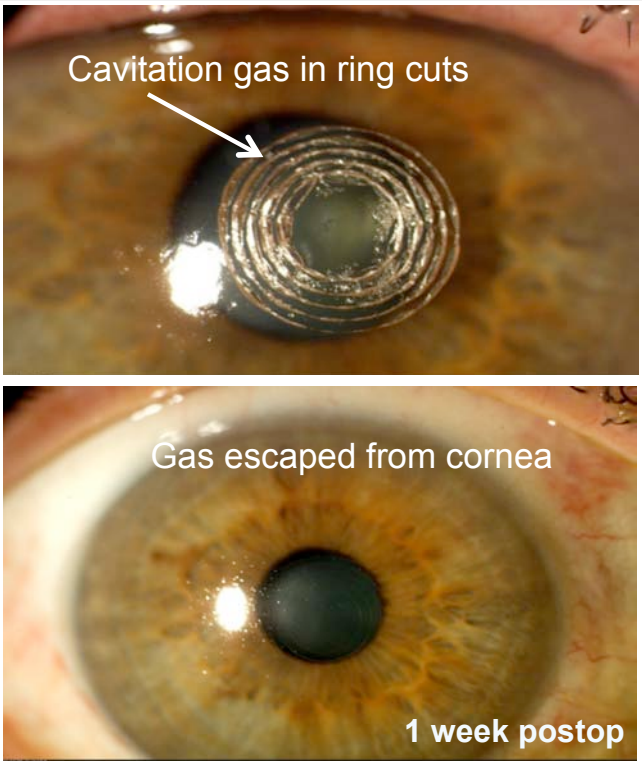

Figure 2. During IntraCor procedure, a femtosecond laser is used to create concentric corneal rings. The cornea becomes multifocal, thereby offsetting presbyopic changes in the lens and improving reading vision.

New treatment options for keratoconus

Yaron Rabinowitz, M.D., Clinical Professor of Ophthalmology, Jules Stein Eye Institute, UCLA School of Medicine, Los Angeles, CA

Dr. Rabinowitz emphasized that the best treatment for keratoconus still remains Rigid Gas Permeable contact lenses because they create smooth anterior corneal surface that surgery can't duplicate.

Surgical procedures are reserved for patients

- who are contact lens intolerant
- have poor vision with contacts
- want to be less dependent on contacts
- have progressive keratoconus

New surgical options for patients with keratoconus

- **Traditional PRK** – can be performed for patients who are over 35 years old, have adequate corneal thickness, forme fruste or mild keratoconus, are prepared to wear a lens if vision deteriorates, and accept a risk of corneal transplant.
- **Topography guided PRK** – although it is not currently FDA approved in the US, this procedure can be performed in Canada and Europe using Wavelight Allegretto laser to treat the thicker areas of the cornea preferentially resulting in a more spherical cornea and better vision quality. It is very promising for mild keratoconus
- **Standard ICL phakic IOL** – can be used to correct up to -20D of myopia. In the US, this is currently reserved for patients with mild astigmatism. Patients with astigmatism more than 3 D should await FDA approval of toric ICL that can correct up to 6D of cylinder
- **Refractive Lens Exchange (RLE)** – can be performed on patients who are presbyopic. Toric IOL can correct up to 3D of astigmatism
- **Intacs + PRK** – studies have shown that uncorrected visual

acuity (UCVA) can improve significantly after the combined procedure. For example, if prior to the procedure, UCVA is 20/100, Intacs can improve it to 20/40. Adding PRK can improve UCVA further to 20/25

- **Collagen crosslinking** (**CXL**) - Collagen crosslinking is a technique for stiffening the cornea. Cross-links can be induced enzymatically by means of aldehydes, chemical fixatives, and photosensitizing radiation (riboflavin + UV). Riboflavin and UV radiation was found to be the most effective and least harmful procedure.

CXL PROCEDURE

- Central 7mm of epithelium is debrided (epithelial debriedment prior to procedure may be important to the success of the procedure. Histological studies have shown that if the epithelium is not removed prior to the procedure, the treatment may only be 25% effective)
- Freshly prepared riboflavin 0.1% solution is applied every 2 minutes for 30 minutes
- Flare in the anterior chamber is checked to confirm riboflavin penetration
- UVA light is administered 5 cm from the eye.

EXCLUSION CRITERIA FOR CXL

- Cornea thinner than 400 microns
- K reading >58D
- Central corneal scar
- Age >35y.o.
- Stable keratoconus
- Preoperative BSCVA 20/25 or better
- Autoimmune disease, herpes, pregnant
- Unrealistic expectations

RESULTS OF CXL

- Clinical studies have shown no progression of keratoconus over a 2-4 year span in 22 eyes and had improved VA in 15 of 22 eyes (May 2003: Gregor Wollensak, MD, Eberhard Spoerl, PhD, Theo Seiler, Phd, MD).
- Most recent study (Jan 2011 J Cat Ref Surg, Hersh PS et al) showed improvement of UCVA, BSCVA, and decrease in K-values in patients who fit the inclusion criteria. These results are consistent with the results of other multiple published clinical studies.

What's new in corneal refractive surgery: techniques and patient selection

Ella G. Faktorovich, M.D., Director, Pacific Vision Institute, San Francisco, CA

Dr. Faktorovich reviewed the currently available femtosecond lasers used for LASIK flap creation, including iFS, IntraLase 60 kHz, Zeimer, and Wavelight FS 200. She compared them to see which one came closest to being ideal for LASIK flap creation. An **IDEAL** femtosecond laser for LASIK flap creation has to have 5 features (**Figure 3**). It has to be **SAFE**, create **SMOOTH** corneal bed, be fast (**SPEED**), create predictable flap thickness, diameter, hinge, side cut angle (**SAME**), and be customizable to any corneal shape, thickness, diameter, appearance (**SPECIAL**). Compared to the currently used systems, iFS laser came the closest to having all five characteristics of the ideal laser.

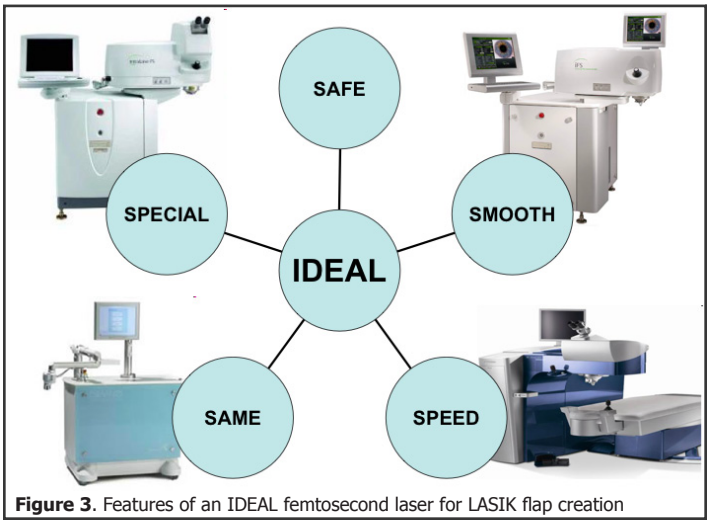

Figure 3. Features of an IDEAL femtosecond laser for LASIK flap creation

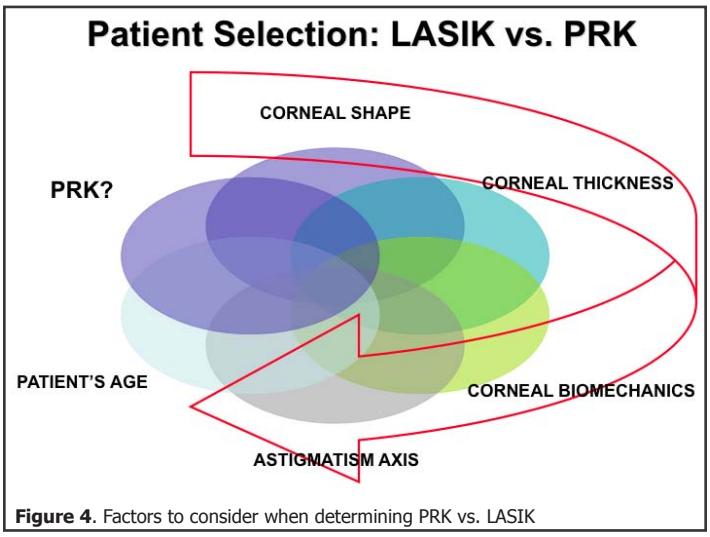

Figure 4. Factors to consider when determining PRK vs. LASIK

Dr. Faktorovich presented the results of a study she conducted comparing vision outcomes with iFS laser vs. IntraLase 60 kHz. While excellent postoperative outcomes were achieved with both lasers, patients who had their LASIK flaps done with iFS had more predictable astigmatism correction. This could have been due to the smoother corneal bed created with iFS and/or the ability to create an elliptical flap in astigmatic patients. Elliptical flap allows for greater exposure of corneal bed in the long axis which, in turn, allows for delivery of the entire ablation diameter. Spherical flaps may not result in as full of a bed exposure available to deliver the entire excimer ablation.

Dr. Faktorovich also presented cases to illustrate the rationale for recommending PRK rather than LASIK. Corneal shape plays the #1 role in determining what procedure is best for

the patient (**Figure 4**). Inferior steepening and skewing of the radial axis are often indications for PRK. Astigmatism axis can be a predictor of whether topographic abnormalities will be found. Patients with against-the-rule astigmatism are more likely to have topographic abnormalities than patients who have with-the-rule astigmatism. Corneal shape needs to be evaluated with many methods, including placedo-disc topography, Pentacam, and the enhanced ectasia screening software to detect all the possible abnormalities, including the very subtle ones (**Figure 5**).

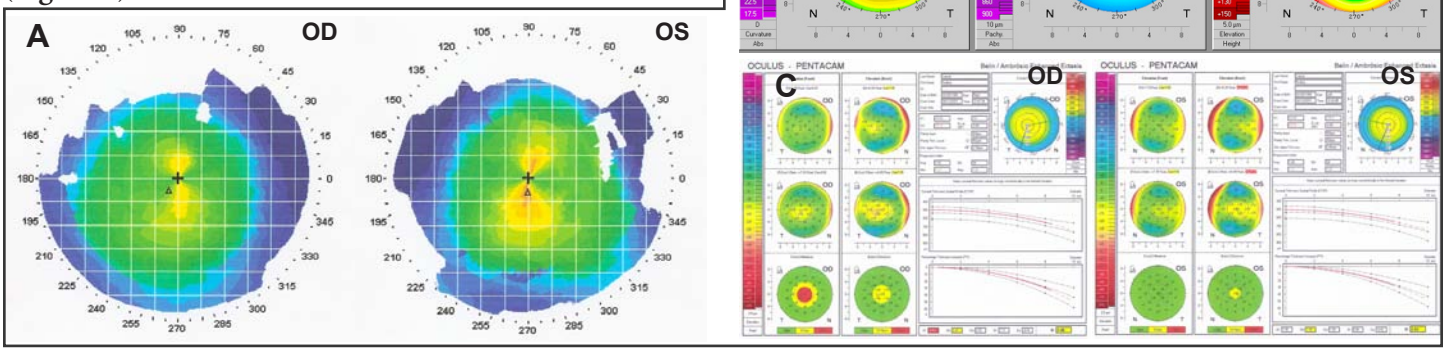

Figure 5. 53 y.o. female with -1.25 – 1.00 x 013 OD and -1.25 -1.75 x 173 OS. (A) Placedo disc topography and Pentacam (B) show symmetric with-the-rule astigmatism. (C)Belin-Ambrosio Enhanced Ectasia screening software, however, reveals anterior and posterior elevation outside the ranges are normal. Based on these findings, PRK was recommended to this patient

Update on antimicrobial therapy in cornea, external disease, cataract, and IOL surgery

Terry Kim, M.D., Professor of Ophthalmology, Duke University School of Medicine, Durham, NC

Dr. Kim presented first-hand experience as well as the results of the clinical trials exploring safety and efficacy of antimicrobial therapy in treatment and prevention of anterior segment infections.

How to treat Herpes Simplex Virus (HSV)

- First, differentiate it from Herpes Zoster pseudodendrite (**Figure 6**), contact lens related defect, healing abrasion, or drug induced lesion (such as with amiodorone and latanoprost).
- Treat epithelial lesions as follows:
  - Topical anitvirals such as 1% Trifluridine (Viroptic) 9x day or 3% ACV ung 5x day, or 0.15% Gancyclovir (Zirgan) 5x day, then taper. If dendrite resolves but keratopathy persists after 2 weeks of treatment with topicals, it is probably medicamentosa. Taper the topicals.
  - Oral antivirals may be added or substituted to treat epithelial disease. These include Acyclovir 200mg 5x day for 10 days or Valcyclovir 500mg bid for 1 week, or Famcyclovir 125 mg BID for 1 week
- Treat stromal keratitis or iridocyclytis as follows
  - Topical steroids + Antiviral cover (either topical or oral)
- Prophylax before refractive, glaucoma, or cataract surgery as follows
  - Oral antiviral (ACV 400 mg BID or TID or VCV 500 mg BID or TID) started 2 days pre-op and continued 7-10 days post-op

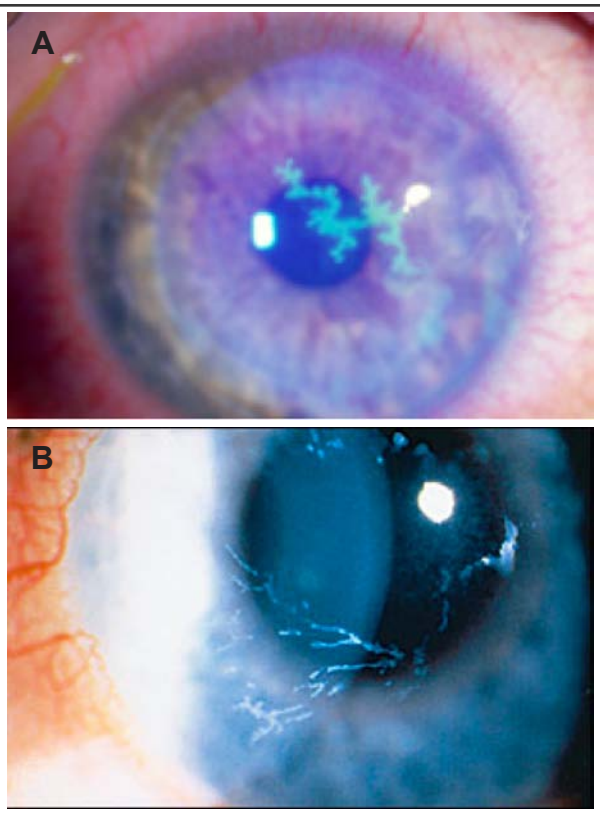

Figure 6. (A)Dendrite, HSV; (B)Pseudodentrite, VZV

How to prevent endophthalmitis in anterior segment surgery

- Preoperatively, treat blepharitis with warm compresses, lid scrubs, Azasite (BID for 2 days, then QHS for 4 weeks)
- Preoperative and postoperative prophylactic antibiotics

New antibiotics – the latest, 4th generation fluoroquinolones

- Mozexa (moxifloxacin 0.5% in Xanthan gum formulation) – BID - results in high eradication rates of common, broad spectrum, bacterial conjunctivitis pathogens.
- Zymaxid (gatifloxacin 0.5%) – BID – but dosing the drug QID delivers more drug to the eye, taking full advantage of the higher concentration of gatifloxacin. BAK in the formulation improves the rate of bacterial kill
- Besivance (besifloxacin 0.6% + DuraSite) – TID – is uniquely formulated with a mucoadhesive DuraSite

ICL Phakic IOLs in the US Military: patient selection, results, and management pearls

Gregory D. Parkhurst, M.D., Chief of Ophthalmology Darnall Army Medical Center, Ft. Hood, TX

The number of ICL procedures performed in the military has been growing. Dr. Parkhurst emphasized that the studies of all refractive technologies in the US Military are especially rigorous, considering extremely high level of vision requirements in that population. Day-time vision is important, but the acuity and quality of night time vision is especially critical since many important operations are carried out at night.

Results of prospective comparative trial of ICL vs. LASIK surgery in US Military

- UCVA 20/20 or better was 96% with ICL and 94% with LASIK
- Postoperative SE +/- 0.5D was 98% with ICL and 92% with LASIK
- Night vision tested with simulated night vision goggle test called the Rabin Super Vision Test (**Figure 7**) was better after ICL. Low luminance visual acuity improved significantly after ICL but not after LASIK (p=0.044). Low luminance contrast sensitivity improved after both ICL and LASIK, but the improvement was significantly greater after ICL (p=<0.001)

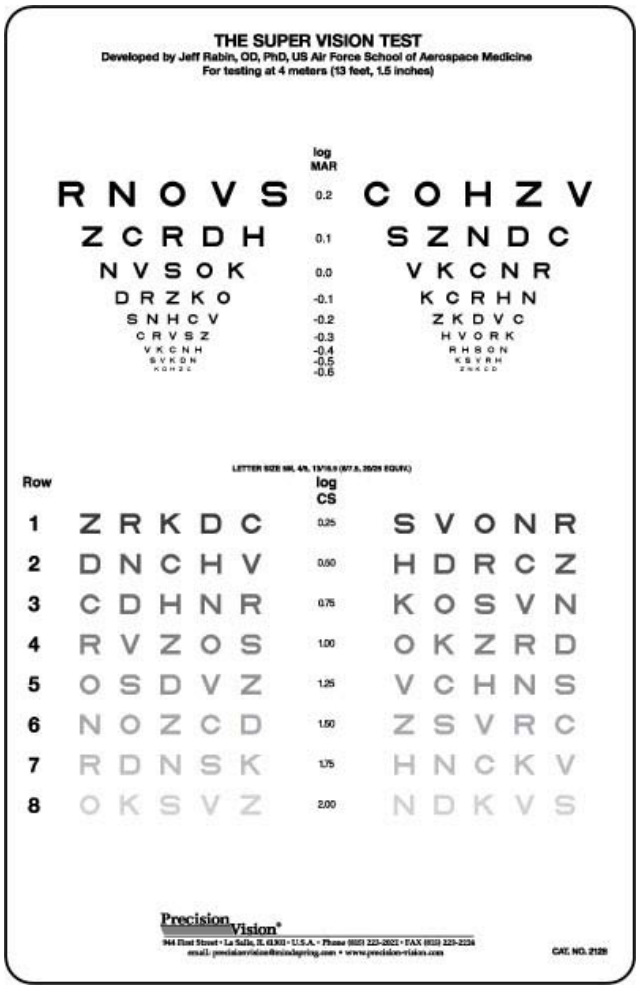

Figure 7. Rabin Super Vision Test includes visual acuity and contrast sensitivity on a single chart. Chart includes eight separate contrast levels for the most precise contrast sensitivity test. Military studies of postoperative outcomes in low luminance showed that both visual acuity and contrast sensitivity at night are better after ICL compared to LASIK.

- ICL surgery is safe – 0% of retinal detachment, 0% of endophthalmitis, 0% of postoperative CME, only 2 cases of cataracts (one case in a patient over 50 years old and the second case in a patient who was placed on systemic steroids due to newly diagnosed lupus postop)
- ICLs are secure and stable in the eye – even extreme trauma, such as grenade blast, does not result in ICL movement

IOL selection for cataract and RLE surgery: toric, multifocal, and accommodating lens update

Neil J. Friedman, M.D., Director Cataract and Lens Surgery, Pacific Vision Institute, San Francisco, CA

Dr. Friedman reviewed the most common IOLs used in eye surgery today. He emphasized that careful planning, accurate measurements, and the ability to do laser vision correction fine-tuning are some of the essential elements to successful surgery and satisfied patients.

IOL Technology	Purpose	Design features
Aspheric	Corrects for spherical aberrations that increase with age	May be incorporated into monofocal, toric, and presbyopic IOL designs
Toric	Corrects astigmatism	
• Alcon AcrySoft SN6AT		acrylic, aspheric, corrects 1.0, 1.5, and 2.0D astigmatism, doesn't rotate much
• STAAR AA4203T		Silicone, corrects 1.5 and 2.25D astigmatism, may rotate
Presbyopic	Improves distance vision and treats presbyopia	
• ReZoom	Distance and intermediate vision in patients without requirement for high quality night-time vision	Refractive multifocal, spherical optic, declining in popularity
• ReSTOR	Distance, intermediate, and near in patients without requirement for high quality night time vision	Diffractive multifocal, aspheric anterior surface
• Technis MF	Distance and intermediate, in patients without requirement for high quality night time vision	Diffractive multifocal posterior surface, aspheric anterior surface
• Crystalens AO	Distance and intermediate, in patients with requirement for good quality night time vision	Accommodating, aspheric optic (AO) is the newest design

Facial aging: causes and treatments

John McCann, M.D., Ph.D., Chairman Department of Ophthalmology IMC and Salt Lake Regional Medical Center, Salt Lake City, UT

Many primary eye care offices are now incorporating service options to help their patients improve facial appearance. We were very pleased to hear from Dr. McCann about strategies to look and feel younger.

Dr. McCann explained that the following factors are involved in aging of the skin: thinning of the epidermis/dermis/subcutaneous fat, loss of turgidity or plumpness due to loss of hyaluronic acid which imbibes water in the extracellular matrix, a decrease in melanocytes making the skin more translucent, and decrease in oil production from the loss of hair follicles and the associated sebaceous glands which leads to dry skin.

Treatment options

- **Chemical (TCA) Peels and Microdermabrasion** – used for superficial smoothing of the skin
- **Ablative Lasers**
  - **CO2 Laser** - used for deeper smoothing of the skin to relieve fine wrinkles, pigmentation, blemishes, and scars. Recovery may be 2 weeks.
  - **Erbium Laser** – used for deeper smoothing to relieve both fine and deep wrinkles. May be better for patients with darker skin. Recovery is faster than CO2 laser (1 week)
- **Non-Ablative Lasers (Fractionated)** – less down time than ablative lasers but require multiple treatments to achieve smoothing effect
- **IPL** - uses broad-spectrum pulses of light to eliminate excessive and enlarged blood vessels, brown marks, decrease pore size, and minimize fine wrinkles
- **Fillers** – collagen, fat, hylaronic acid (HA), etc. Fat may result in a bumpy look. HA may be useful to treat bags under the eyes by filling in the space between the cheek and lower adnexa (**Figure 8**). In some patients this may result in a better appearance than fat and skin excision. The HA filler can be dissolved to reverse the procedure.
- **Botox** – injecting it into muscle will relax them and reduce wrinkling of the skin
- **Forehead Lift** – can often be used to treat excessive upper eyelid skin. This method often produces more natural looking appearance of the eyes than upper eye lid blepharoplasty.

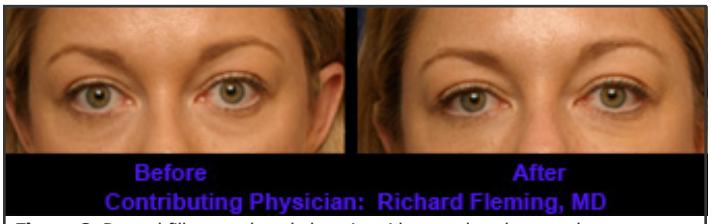

Figure 8. Dermal fillers, such as hylaronic acid can reduce bags under eyes

Diagnosing and managing retinal findings in pre- and post-cornea, cataract, and lens surgery patients

J. Michael Jumper, M.D., Chief of Retinal Division, CPMC, San Francisco, CA

Dr. Jumper emphasized that a thorough preoperative examination is essential to detect and treat retinal findings before anterior segment surgery is performed. Not all findings, however, require treatment. Asymptomatic lattice (**Figure 9**) and asymptomatic retinal holes without subretinal fluid do not require treatment prior to LASIK/PRK and intraocular surgery

Patients should be referred for prophylactic treatment of retinal breaks when

- They are symptomatic
- Subretinal fluid is present
- Fellow eye had retinal detachment
- Patient has poor access to care
- Patient can't report symptoms of retinal detachment due to language barrier, for example

Risk factor for retinal detachment is myopia rather than LASIK surgery. Patients at risk are those with myopia of -6D and greater and/or axial length of 26 mm and greater. Every 1mm of axial length leads to a 1.3x increase in risk. Patients should be given proper counseling about the importance of continuing yearly exams after refractive surgery to monitor the health of the retina. Signs and symptoms of retinal detachment should be reiterated during each exam to insure prompt reporting.

ICL does not increase risk of retinal detachment and is a safe procedure for high myopes and patients who are not candidates for LASIK or PRK.

Lens and cataract surgery in high myopes increases the risk of retinal detachment. This needs to be considered when deciding on what type of surgery is best for the patient. LASIK, PRK, and ICL may be better options for high myopes. Patients undergoing cataract surgery need careful evaluation of retinal periphery and if they have suspicious thinning areas, they need to be referred to retina specialist for evaluation and management. Hyperopes do not have increased risk of retinal detachment with lens and cataract surgery.

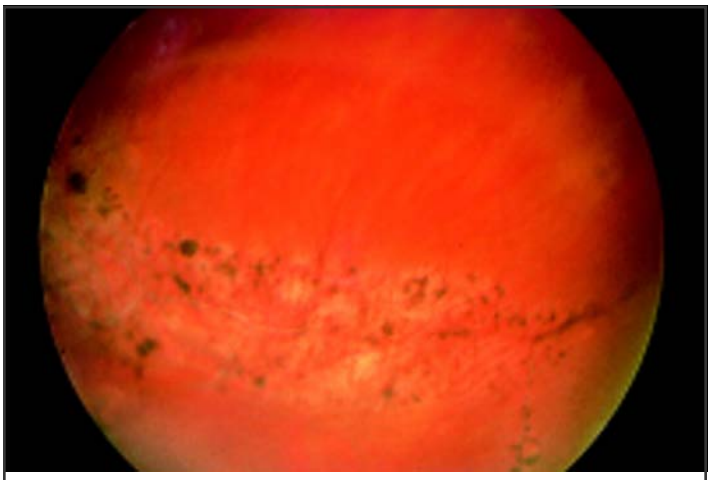

Figure 9. This type of lattice retinal degeneration doesn't typically need to be treated prior to LASIK unless the patient is symptomatic, there is subretinal fluid, and/or fellow eye had retinal detachment.

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Sight Gags *by Scott Lee, O.D.*

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