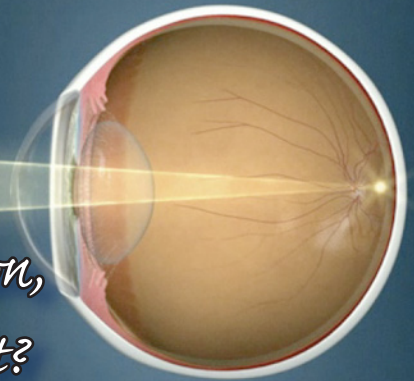


Staying on top of managing refractive surgery patients

What's new in screening, procedure selection, treatment options, and postop management?



Refractive surgery is a fast moving specialty driven forward by doctors, scientists, technology companies, and, very often, patients. We all have the same goal – safe and effective treatments, fast and easy recovery, and, seamless experience for each patient. Our current technology and techniques have advanced to help us accomplish this goal. In this issue of eFocus, we will discuss the latest strategies in diagnostics and treatments and will share case examples where those modalities proved useful in optimizing patient's results and experience.

Corneal Hysteresis and Corneal Resistance Factor – new screening tools to help match the right procedure to the right patient

While we can use age and refractive error alone, in most cases, to determine if a patient is a candidate for refractive surgery, we use corneal topography and pachymetry to guide us in the procedure choice. Placido disc topography reveals how smooth and symmetric the anterior cornea is. We can then use the Randleman Risk Score Criteria,¹ to assign a risk factor to different topographic patterns that may be associated with corneal ectasia if LASIK were to have been performed. Topographic risk factor is then added to other potential risk factors, such as central corneal thickness, residual stromal bed, refraction treated, and age. A composite risk factor is calculated. If it is low, then LASIK can be performed. If it is higher, then PRK or lens surgery is recommended. Orbscan and Pentacam can offer additional information about cornea – it's posterior surface and the location of the thinnest point on the cornea. Although its significance is debatable, the presence of a "posterior float" or "posterior elevation" on Orbscan or Pentacam may steer the surgeon toward PRK rather than LASIK, especially in the presence of anterior corneal surface abnormalities. Inferior location of the thinnest corneal spot may also steer toward PRK.

In some patients, however, the diagnosis may be ambiguous. To improve diagnostic precision, we have added another tool. We now perform corneal biomechanics measurements, in addition to topography and pachymetry, in every patient undergoing refractive surgery. Biomechanics is a dynamic measurement that describes the behavior of a visco-elastic system, such as cornea and includes several parameters. One parameter represents static resistance or elasticity as with a coil spring and another represents viscous resistance or dampening as with a shock absorber. The Ocular Response Analyzer

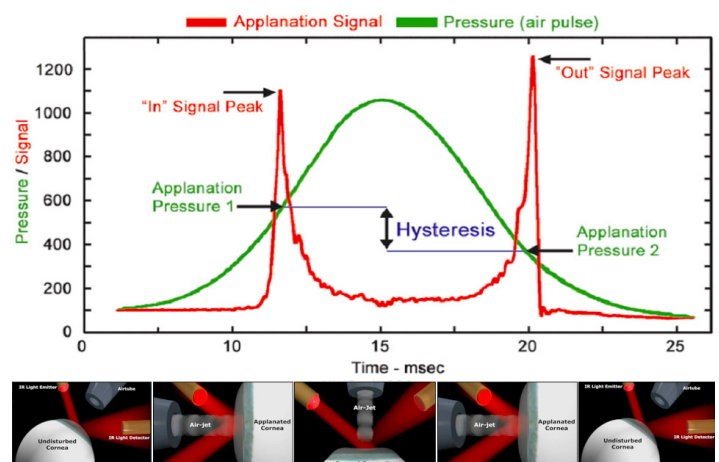


Figure 1. Applantation Signal Plot. Corneal Hysteresis (CH) and Corneal Resistance Factor (CRF) measurements are generated from the plot

In a study presented at the 9th Annual San Francisco Continuing Education Symposium, researchers from UCLA Jules Stein Eye Institute compared CH and CRF values in normal, forme fruste, and keratoconus eyes. They found that eyes with forme fruste keratoconus have, on average, lower CH and CRF values than normal corneas. In fact, CH and CRF values in the forme fruste keratoconus eyes are more similar to those in eyes with frank keratoconus on topography than to the topographically normal eyes. Correlation was independent of patients' age, gender, and central corneal thickness. These results, used together with topography and other risk factors can better direct a decision to proceed with LASIK or switch to PRK.

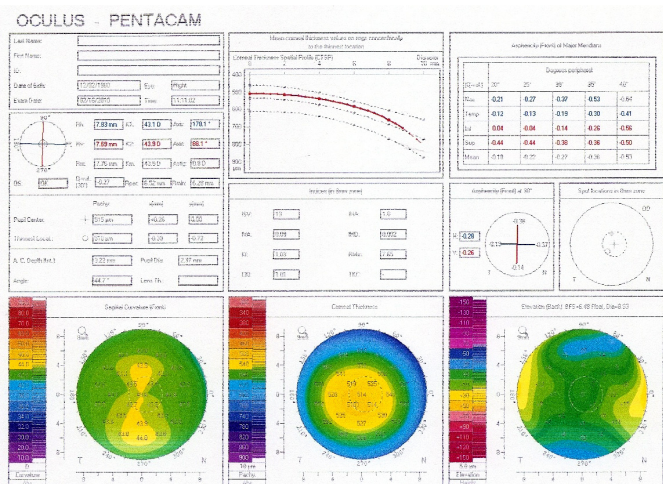
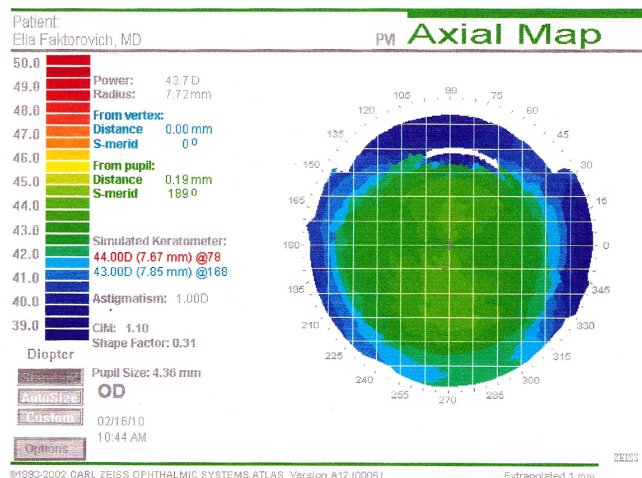


Figure 2. Patient D.X. Topography (A) and Pentacam (B) are normal.

Patient D.X.

30 y.o. woman engineer at Epocrates.com.

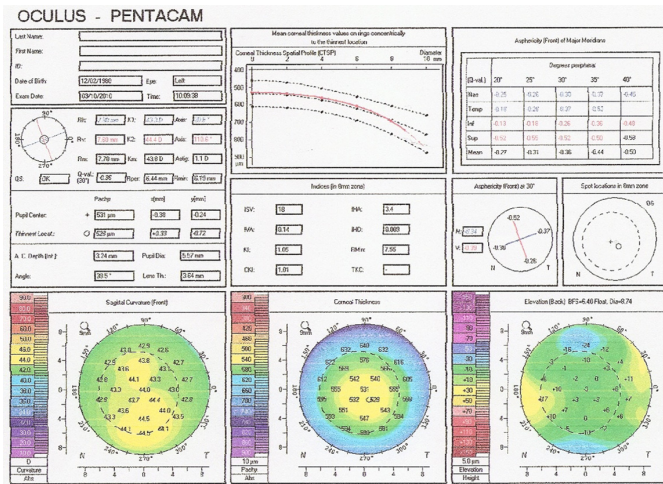
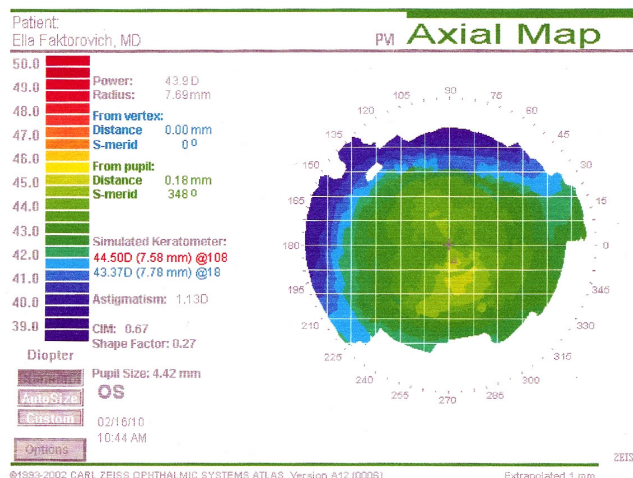
- 7.00 – 0.50 x 160 (20/15) OD
- 7.25 – 0.25 x 031 (20/15) OS
- Pachymetry 514 OD and 529 OS

Topography and Pentacam are normal (**Figure 2**). Although the cornea is slightly thin, thin flap LASIK would have left adequate residual stromal bed. Ocular Response Analyzer (**Figure 3**), however, shows very low CH and CRF values OU, suggesting corneal biomechanics measurements in the range for forme fruste keratoconus.

Procedure Recommended: PRK OU

OUTCOME:

- UCVA 20/20 OD and 20/15 OS
- - 0.25 - 0.25 x 135 (20/15)
- - 0.25 (20/15)



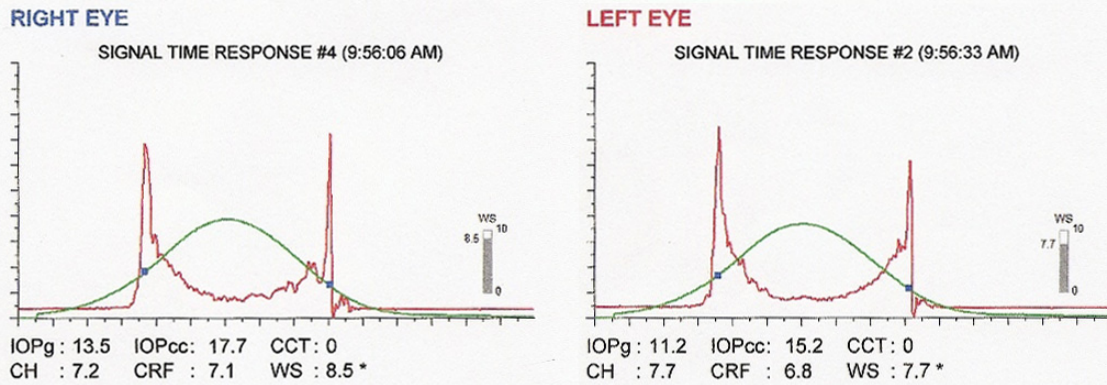


Figure 3. Patient D.X. Ocular Response Analyzer shows low CH and CRF values.

Average age for LASIK/PRK is decreasing – patients as young as 18 are having LASIK/PRK and presbyopes are shifting toward Refractive Lens Exchange (RLE)

We recently compared the average age of patients who underwent laser vision correction at Pacific Vision Institute during the past 24 months to that of patients who underwent the procedures during the two years prior to that time. The average age has decreased from late 30's to late 20's. Two factors account for this:

- LASIK/PRK is an accepted treatment of refractive error in young patients.
 - LASIK/PRK is FDA-approved for patients as young as 18 years old.
 - In many instances, parents and older siblings of these young patients had their vision successfully corrected. Many had procedures more than a decade ago and had good uncorrected vision since then. They are enthusiastic about recommending the procedure to their kids and younger siblings.
 - Young patients are comfortable with technology and its application to health and well-being.
 - Word-of-mouth spreads rapidly among this generation of patients who have 24/7 access to social networking and patient review websites.
 - Many of these patients don't see themselves wearing glasses and contacts permanently – some are anxious to get vision correction as soon as they turn 18.
 - Large population studies have revealed refractive error stability in patients as young as 18 who have varying levels of refractive error, including low myopia.²
- Presbyopes are better suited for Refractive Lens Exchange.
 - With LASIK/PRK and CK, distance and near vision can be accomplished with monovision. Patients who are not good candidates for monovision do best with Refractive Lens Exchange (RLE) with presbyopic IOL.
 - Presbyopes are older and more likely to have unstable ocular surface and dry eyes. RLE is not drying and can

often be performed even in patients with dry eyes regardless of their refractive error.

- RLE is the best option for older hyperopic presbyopes. Even patients with mild hyperopia can experience dryness during postoperative period after corneal refractive surgery. The hyperopic correction creates an oblate cornea that's "lifted" above the tear film, like an island in a sea. Additionally, older patient's tear film is often compromised – they may have both evaporative and tear deficient tendency toward dry eye. These two components may result in prolonged vision recovery, eye irritation, redness, and burning in presbyopic patients undergoing LASIK/PRK. RLE avoids these postoperative issues – vision recovery is fast and the eyes are comfortable. Patients don't need to use eye drops for extended periods of time.

Patient M.D.

18 y.o. man porter at Royal Motor Sales, hopes to be a baseball player, can't wear contacts, glasses limit peripheral vision

- MRx +4.25 - 1.75 x 166 (20/20) OD
+4.25 - 2.50 x 012 (20/30) OS
- CRx +5.25 - 1.75 x 166 (20/20) OD
+5.75 - 2.50 x 012 (20/30) OS

- Pachymetry 568 OD and 558 OS
- Topography and Pentacam are normal (Figure 4). Ocular Response Analyzer shows normal CH and CRF values OU (Figure 5).

Procedure Recommended: LASIK OU, aim for spherical equivalent half-way between MRx and CRx OU.

OUTCOME:

- UCVA 20/25 OD and 20/30 OS
- +0.75 - 0.25 x 150 (20/20)
- +0.50 (20/30)

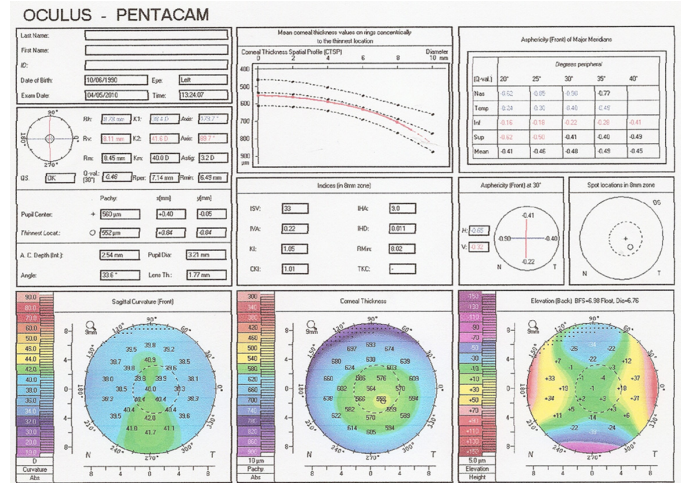
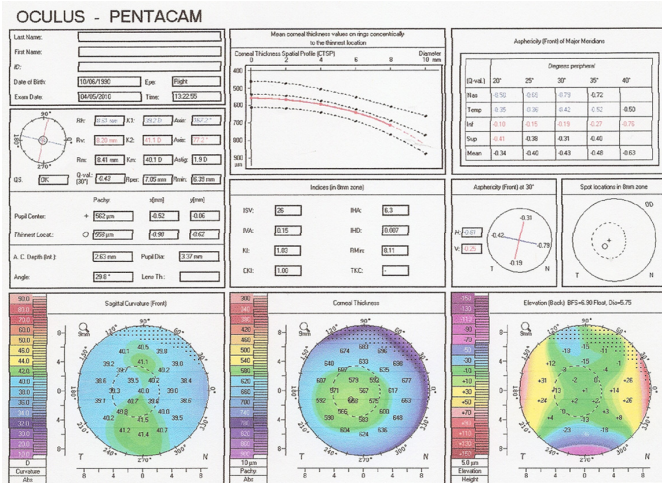
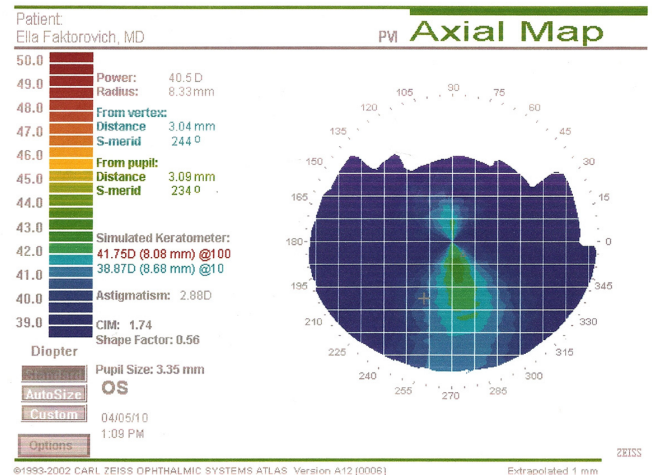
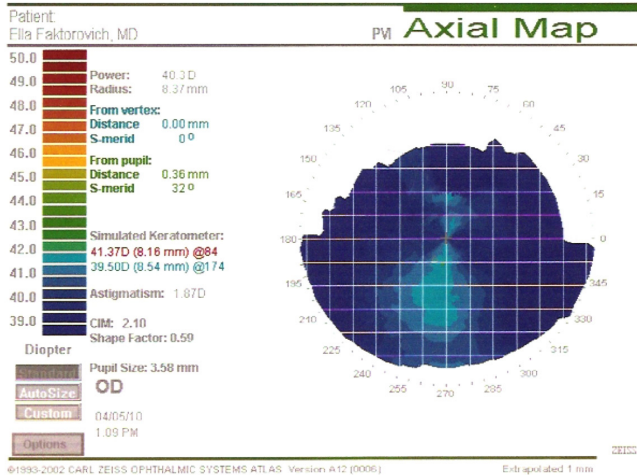


Figure 4. Patient M.D. Topography (A) and Pentacam (B) are normal.

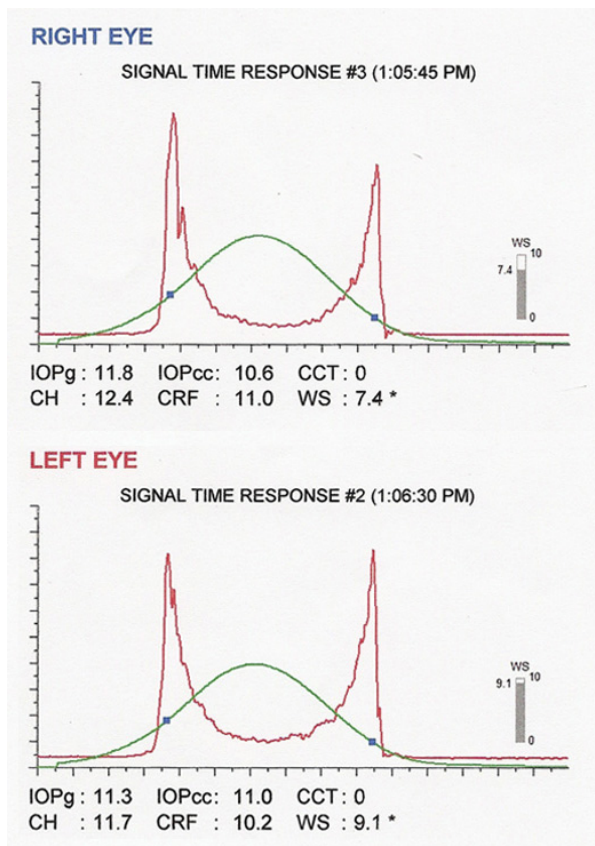


Figure 5. Patient M.D. Ocular Response Analyzer shows normal CH and CRF values

Patient B.S.

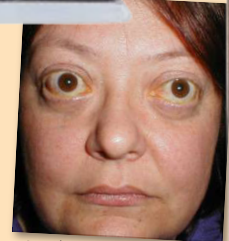
60 y.o. woman administrator at Polaris Financial who presents for LASIK consultation.

- MRx - 4.00 - 0.50 x 180 (20/20)
- 4.75 - 0.75 x 010 (20/20)
- Topography, Pentacam, ORA = normal
- History of Graves and dry eyes
- ? LASIK ? PRK

Procedure Recommended: RLE OU with Crystalens. Crystalens is the best presbyopic IOL option for this patient due to history of dry eyes. Multifocal IOLs are contraindicated in patients who are at high risk for ocular surface disturbance.

Outcome:

- UCVA 20/20 OU and J2 OU



PVI patients with varying amounts of refractive error achieve excellent outcomes with ICL phakic IOLs

We have successfully corrected refractive error as low as -4D and as high as -15D with ICL phakic IOL. To avoid patient confusion and disappointment that they are not a “LASIK candidate”, we present lens implant treatment to every patient during their initial consultation. We also encourage optometric offices to discuss this option with every patient referred for vision correction surgery, regardless of their refractive error, to better prepare the patient for different treatment options. Patients with corneas too thin and/or too irregular for LASIK/PRK and refractive error too high are corrected with ICL.

We also had success with correcting astigmatism during ICL procedure using Limbal Relaxing Incisions (LRIs). Patients with astigmatism up to 5 D can have LRIs to bring the astigmatism down to visually acceptable levels. Residual astigmatism can, of course, be easily corrected with LASIK/PRK.



Figure 6. Patient J.L. with Dr. Victor Chin (right) – Director of Lens Services at Pacific Vision Institute and Jenna Froess (left) – Patient Care Coordinator at Pacific Vision Institute

Aggressive management of dry eyes, based on age and gender, results in quick resolution of symptoms

To most patients, dry eye symptoms are more of a nuisance than a serious problem. Yet to some, the symptoms can be so aggravating that they become a serious concern. The most important first step in managing dry eyes is to listen to the patient and don't dismiss their concerns. Once the concerns are validated and the patient sees you on the same team as they are, they are more likely to follow your treatment plan. It is also important to realize that even though the patient may have had LASIK/PRK a while before the onset of their dry eye symptoms or there may be confounding variables such as menopause, blepharitis, certain medications, etc, the patient will likely attribute their symptoms to their LASIK/PRK procedure. It is generally counterproductive to try and prove them wrong. Instead, focus on coming up with an effective treatment plan and recovery.

We found that older women, peri- or post-menopausal, have both tear deficiency and evaporative dry eye. Common symptoms include – redness, burning, and blurry vision. Sex hormones, such as DHEA – a precursor to estrogen and progesterone – target both lacrimal and meibomian glands. Declining levels of sex hormones with age result in declining function of the target organs.³ The mechanism by which declining levels of sex hormone result in declining function of target organs appears to be increased inflammation in the target organs. ⁴ In fact, while sex hormone levels decrease with age, the levels of inflammatory mediators increase with age throughout the entire organism. Successful treatment of dry eyes in older women can, therefore, be achieved through topical anti-inflammatory and hormone therapy.

Patient J.L.

32 y.o. woman teacher presents for LASIK consultation.

- MRx - 10.00 – 2.00 x 005 (20/20)
- 10.50 – 1.50 x 154 (20/20)
- Topography, Pentacam, ORA = normal
- Pachymetry (Pentacam) 520 OD and 514 OS

Procedure Recommended: ICL phakic IOL OU

Outcome:

- UCVA 20/15 OD and 20/20 OS

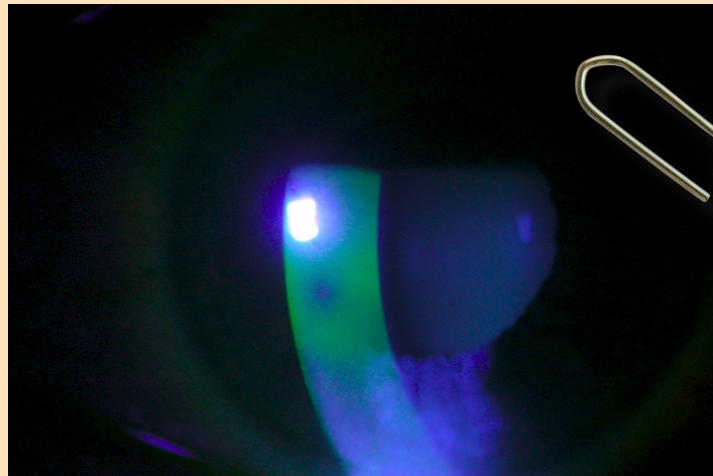
Patient C.D.

49 y.o. woman, investment banker, CL wearer, underwent LASIK OU 5 years ago to correct -2.50 D OU with IntraLase 110 micron flap and 6.5 mm ablation zone. Postoperatively, she noted her eyes "feel dry" and punctate keratopathy was detected. Silicone punctal plugs were placed in lower lids OU and she was started on Restasis BID. She did well until she presented a year ago the following symptom "my eyes burn all the time." She was now peri-menopausal and taking Estrogen. She was also using Restasis BID. The plugs were still present. TBUT was 5-7 mm (Figure 7). Schirmer's were 5 mm OD and 3 mm OS.

DIAGNOSIS: Tear deficiency and evaporative dry eye associated with peri-menopause

TREATMENT:

- Continue punctal plugs + Restasis
- FML QID + Omega-3 and -6 supplements + Soothe every 1-2 hrs
- F/U in 2 weeks
- "No change"
- Replace FML QID with Dexamethasone 0.1% BID
- F/U in 2 weeks
- "A little better"
- Replace Restasis with Cyclosporine A (CSA) 1% BID
- Continue Dexamethasone 0.1% BID
- F/U in 2 weeks
- "MUCH BETTER"
- Decreased Dexamethasone 0.1% to QD
- After 4 weeks, stopped Dexamethasone 0.1% and continued with CSA 1%
- Patient continued to do well, but CSA started irritating her eyes on instillation
- Started DHEA 1% QID (pro-hormone for estrogen and testosterone)
- Patient is doing well



In men and younger women who are not taking medications contributing to dry eye, the predominant component of their dry eye is lid disease. The treatment, therefore, targets the lids to stabilize the tear film. If tear deficiency is also present, lid disease is treated first, followed by treatment of tear deficiency.

Patient C.H.

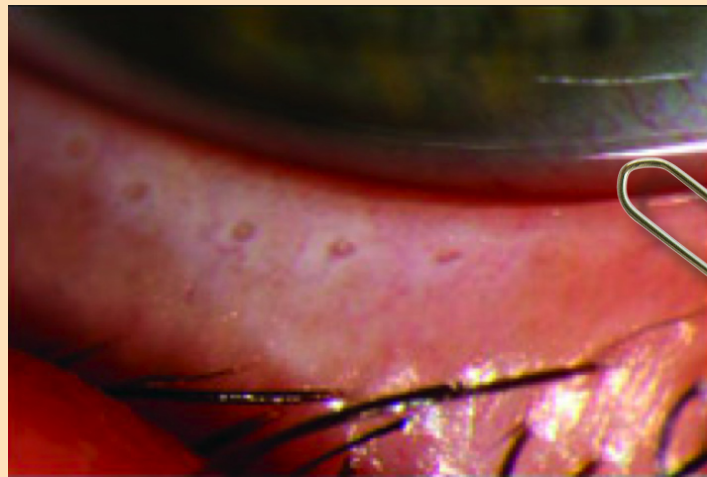
28 y.o. man who works in real estate marketing company CL wearer, underwent LASIK OU a year and three months ago to correct -3.25 D OU with IntraLase 120 micron flap and 6.5 mm ablation zone. At his 3 month postoperative visit, he noted that his eyes felt "dry." TBUT was 10 seconds OU and he was recommended lid hygiene and Optive drops prn. He was lost to follow up. At 11 months postop, we noted a posting on a popular patient review site that read as follows: "my vision is great but it's uncomfortable all day every day...they feel tight...almost like having contacts in. I tried all eye drops available and nothing helps." Recognizing the initials and the time frame of the procedure, we determined this patient's identity and reached out to him. He was eager to come back and explore treatment options. On exam, TBUT was 5 seconds and Schirmer's were 2 mm OU. His lid margins were inflamed and meibomian gland orifices were inspissated (Figure 8).

DIAGNOSIS: Tear deficiency and evaporative dry eye associated with meibomian gland dysfunction

TREATMENT:

- Treat lid margin disease
 - Warm compresses and lid scrubs BID
 - Doxycycline 100 mg po BID
 - Azasite BID for one week, then QD x 2 weeks
- F/U in 3-4 weeks
- "Better: went from 9 to 7 (may be 6)"
- Lid and conjunctival redness decreased to "trace"
- Lower lid silicone punctal plugs placed
- F/U in 3 weeks
- "I am now at 3"
- Lid and conjunctival redness remains at "trace"
- Decrease Doxycycline to 50 mg BID
- Patient is doing well

Although warm compresses and lid scrubs remain the main stays of treating lid disease, Azasite may provide an easier-to-comply-with alternative for many patients.



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Pacific Vision Institute Optometric CE Program

- 07/15/10 PVI Patient Seminar (please inquire with Jayson Jonsson about details and space availability)
- 07/22/10 "Medications for cornea and anterior segment" Pacific Vision Institute, San Francisco, CA
- 09/16/10 "Cataract and Lens Surgery" Pacific Vision Institute, San Francisco, CA
- 10/14/10 "Answering your patients' questions about refractive surgery" Pacific Vision Institute, San Francisco, CA

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When superheroes hit their 40's...

Scott F. Lee, O.D., Editor-in-Chief, *eFocus*.

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