Issue 039 • January 2011

eFocus

Excellence in Co-Managed Care

PACIFIC VISION INSTITUTE • Life in Focus

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Refractive, Cornea, Cataract, and Lens Surgery 2011

What to expect this year

As we enter the new decade, we have exciting things to look forward to. Technology keeps racing ahead with breath taking speed. We talk less to each other, and yet we communicate instantly. We have data at our fingertips. We can access our patients' charts immediately from anywhere in the world. Vision science kept pace with technological breakthroughs. We now have 5th generation lasers that can create a corneal plane as smooth as glass. We can use ultra-fast lasers to break up the hardest cataract with utmost safety. We can image the cornea in a myriad of ways. We can reverse presbyopia. We can treat infections quickly and safely. As we enter 2011, we look forward to the year of fantastic scientific innovations that will allow us to give our patients the very best science can offer.

REFRACTIVE SURGERY

iFS Advanced Femtosecond Laser System - a 5th generation femtosecond laser for increased LASIK safety and outcomes

Femtosecond laser has been the safest, most precise way of doing LASIK surgery for nearly a decade.[1] At Pacific Vision Institute, we have been early adopters of femtosecond technology and have transitioned from the mechanical microkeratome to the IntraLase technology as soon as it became clear that with this refractive surgery method we can produce superior results. Over the years, as the laser speed increased from 15 to 30 Hz and then to 60 Hz, we've kept upgrading the technology. Most recently, we became the first center in San Francisco and one of only two in the Bay Area to transition to the AMO iFS Advanced Femtosecond Laser System (**Figure 1**). Currently, there are multiple femtosecond lasers available for LASIK flap creation – AMO IntraLase 60Hz,

Figure 1. Dr. Faktorovich doing iFS LASIK procedure. The entire procedure is visualized on the high resolution video screen. Light adjustment is made based on whether procedure is performed on a light or a dark eye.

Ziemer FEMTO LDV, Alcon Wavelight FS 200, Carl Zeiss Meditec VisuMax, and Technolas Perfect Vision.

With several different femtosecond laser platforms available to create a LASIK flap, why did we select iFS?

- iFS is the only technology that allows for the **inverted bevel-in side cut** (**Figure 2**). With all the other femtosecond lasers, including IntraLase 60Hz, the side cut angle is shallow, less than 90. With some lasers, such as Zeimer Femto LDV, for example, the sidecut is so shallow that it resembles mechanical microkeratome. Inverted bevel-in side cut increases flap apposition and adhesion postoperatively for optimal wound healing. The flap is more stable and is less likely to slip. Peripheral gutter is minimal reducing the incidence of epithelial ingrowth. Very importantly, the nerve apposition is optimized. This results in faster nerve regeneration postoperatively, less of a reduction in corneal sensation, and reduced incidence of dry eyes.

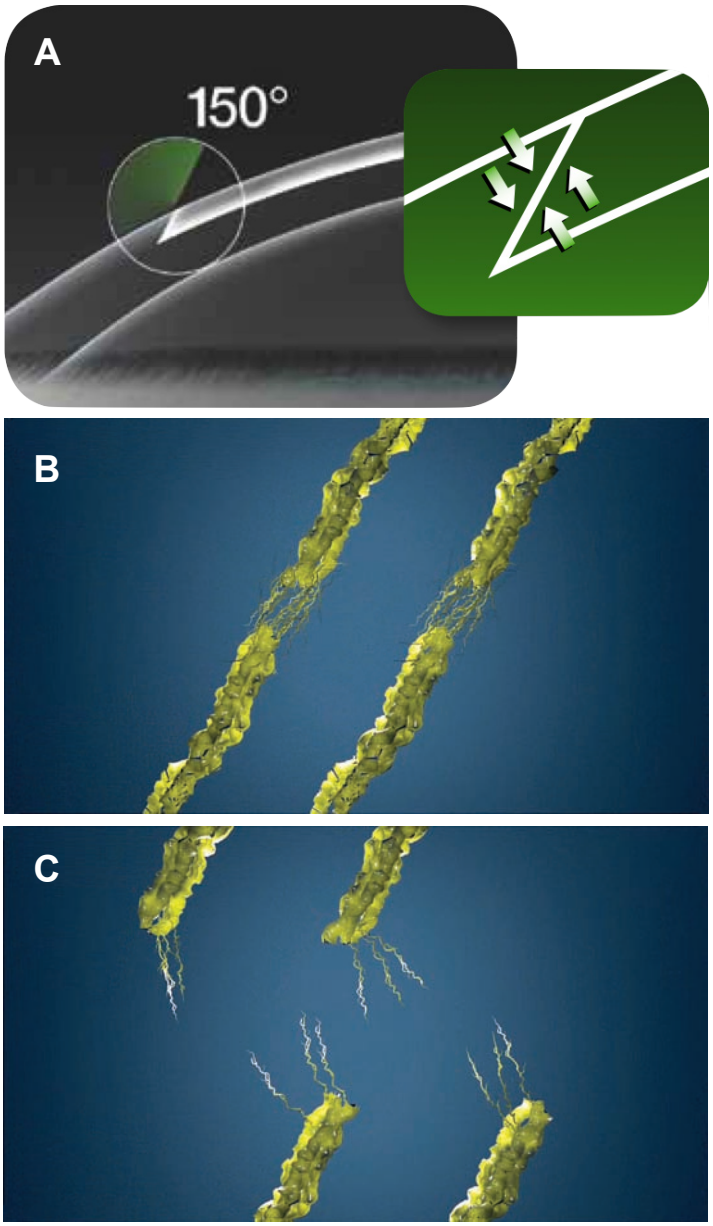

Figure 2. (A) Inverted bevel-in side cut with iFS laser (B) promotes better corneal nerve apposition (C) and faster regeneration compared to the bevel out side cut

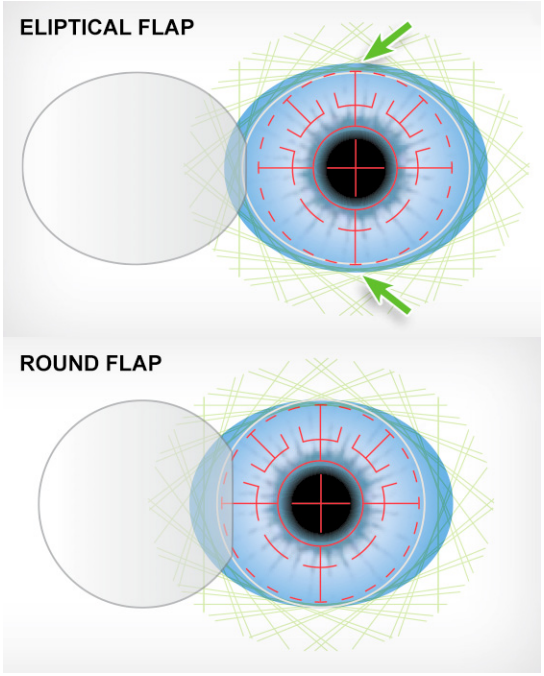

Figure 3. Elliptical flap may distribute forces more symmetrically in an astigmatic cornea. It may also optimize stromal bed exposure and allow for preservation of more corneal fibers to enhance biomechanical stability.

- iFS is the only technology that allows for creation of an **elliptical LASIK flap** (**Figure 3**). With all the other femtosecond lasers we can create only a spherical flap. With the iFS, we may chose to do either spherical or elliptical flap. Elliptical flap is useful in patients with astigmatism, allowing for symmetric distribution of forces in the elliptical cornea. It may also spare some collagen fibers to enhance biomechanical stability.

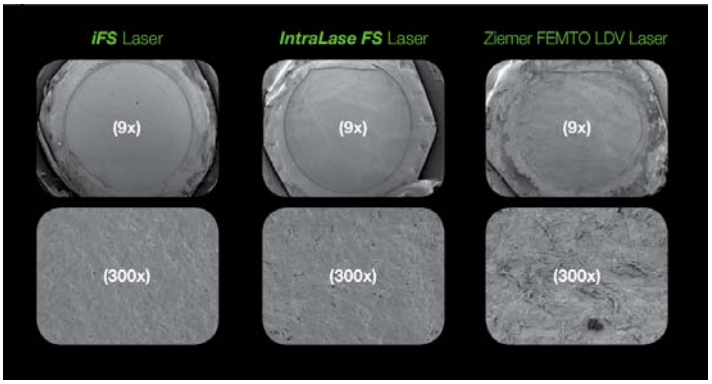

Figure 4. Corneal bed roughness is the lowest with iFS laser at 39.55 nm. Corneal bed is rougher with IntraLase at 41.20 nm. Corneal bed is the roughest with Ziemer FEMTO LDV at 42.87 nm.

- iFS results in the smoothest corneal bed (**Figure 4**). Smoothest corneal bed results in the most precise visual acuity outcomes and the lowest induced higher order aberrations
- iFS is the 5th generation femtosecond laser which means that the technical details have been worked out and optimized a long time ago. It is years ahead of any other platform and this translates into piece of mind for the patient, the surgeon, and the co-managing doctor.

New Belin-Ambrosio Enhanced Ectasia screening software in Pentacam allows for increased sensitivity in detecting corneal ectatic conditions

LASIK screening requires accurate detection of predisposition to potential corneal instability. With Pentacam, unlike other corneal mapping devices, the camera doesn't block the central cornea because it is positioned at the periphery of the cornea rather than centrally. This allows for accurate imaging of the central cornea rather than extrapolating the data from the surrounding periphery. Pentacam's software has been updated to include Belin-Ambrosio screening program that allows for detection of very subtle forms of corneal ectasia. The display combines elevation based mapping and pachymetry progression. Elevation based mapping uses a new method to fit the sphere to the cornea, called the enhanced BFS. This enhanced BFS is computed by excluding all the data from 3.5 mm optical zone centered on the thinnest portion of the cornea from the standard BFS of an 8.0 mm optical zone. By eliminating the conical portion of the cornea from the BFS computation the enhanced reference surface serves to accentuate subtle ectatic protrusions while having little if any effect on normal corneas. The Belin-Ambrosio display computes the change in elevation values going from the standard BFS and the enhanced BFS. This change has been shown to be a key differentiator between normal and ectatic corneas.

During the development of the software, more than 800 eyes were examined to create parameters for normal, borderline, and ectatic corneas. These parameters include a combination of front elevation, back elevation and pachymetry progression. The parameters are analyzed individually and together to allow for combined risk calculation.

In a recent case report published in Journal of Refractive Surgery, the usefulness of Belin-Ambrosio software in detecting predisposition to corneal thinning was identified.[2]

In this case report, the contralateral unoperated eye in a patient who developed keratoconus in the operated eye was imaged using Belin-Ambrosio software. Even though placedo disc topography and pachymetry were normal, the enhanced BFS map revealed subtle abnormalities. Progression of corneal thickness also revealed abnormalities. Interestingly, corneal biomechanics measurements with Ocular Response Analyzer (ORA) revealed low corneal hysteresis and corneal resistance factors. Current advanced screening of refractive surgery candidates needs to include Belin-Ambrosio Enhanced Ectasia screening and Ocular Response Analyzer.

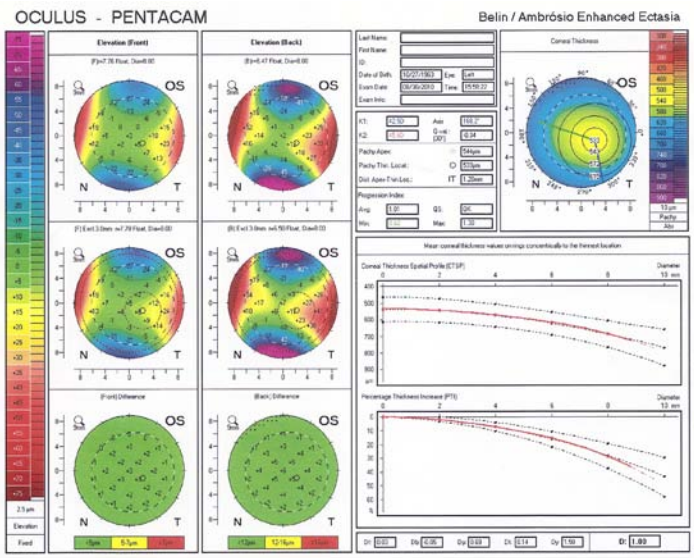

Figure 5A. Patient with high astigmatism. The readings show that this map is symmetric and the numbers fall within the acceptable range. LASIK was recommended for this patient.

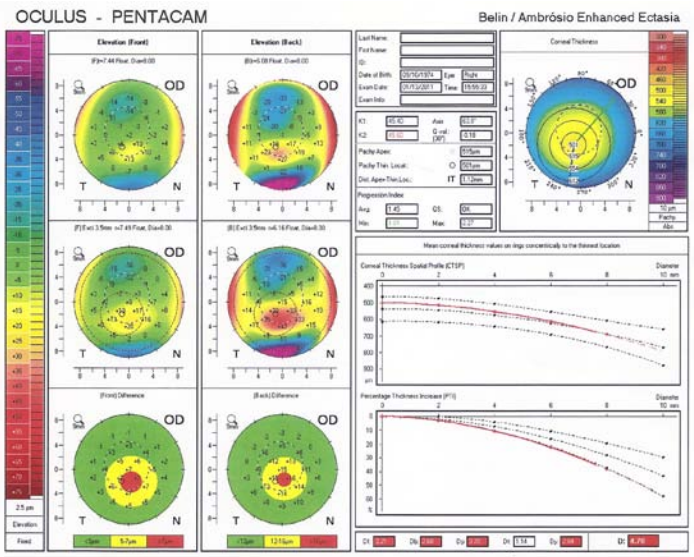

Figure 5B. Patient with keratoconus. Obvious abnormalities appear in "red." Abnormalities are most pronounced on the Enhanced BFS scan (middle row on the left side of the scan). Intacs were recommended for this patient.

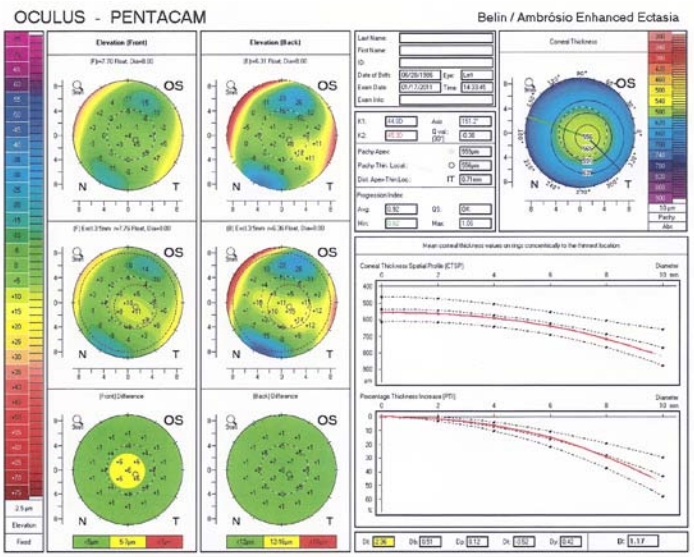

Figure 5C. Patient with spherical myopia and unremarkable Standard BFS (top row on the left side of the scan). Enhanced BFS (middle row on the left) shows possible posterior float and central anterior elevation. PRK was recommended for this patient

CATARACT

Femtosecond laser cataract surgery

At the recent American Academy of Ophthalmology meeting the outcomes data of the femtosecond laser cataract surgery was presented.[3] Three different femtosecond lasers have entered the arena of cataract surgery, thereby revolutionizing nearly every single step of the procedure. From the initial incision, to the capsulorhexis, to the nuclear breakdown, the femtosecond laser is surpassing all previous technologies in safety and outcomes. Cataract surgery has entered a new era.

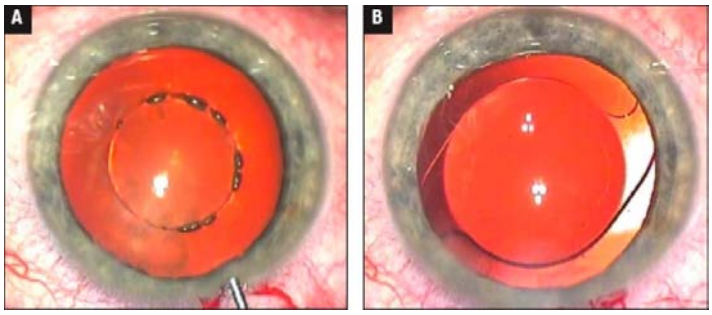

Figure 6. Capsulorrhexis performed with femtosecond laser is centered and predictable (A) resulting in safe and centered IOL implantation (B). Postoperatively, asymmetric capsular contraction is minimized resulting in increased stability of refractive outcome.

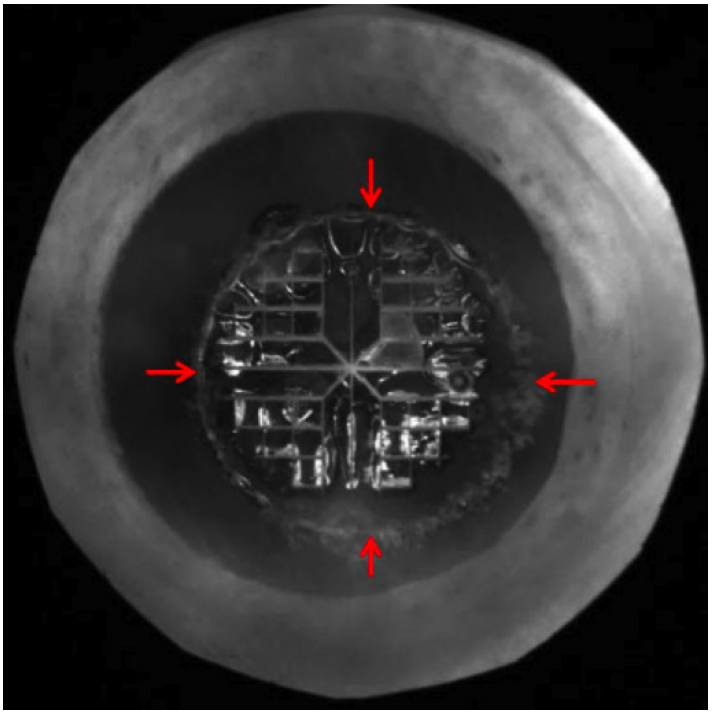

Figure 7. Lens fragmentation is performed with the laser. The fragments of even mature nuclei can be easily removed

LENS

With premium IOLs customization is key

When patients ask what type of special lens we use in cataract and lens replacement surgery, we answer "all of them." From toric lenses, to multifocal lenses (including ReSTOR and Technis), to the Crystalens, the lens recommendation needs to be geared toward each patient's unique postoperative vision requirements and their eye anatomy. Both factors have to be kept in mind as more lens designs enter the cataract surgery arena. Surgical co-management with surgeons who are equally facile in all types of IOL implantation is critical to satisfied patients. The ability to fine tune with corneal laser is also essential.

A patient who wants excellent distance vision, was successful in monovision contact lenses, and has corneal astigmatism is best corrected with a toric IOL. A myope who wants good reading vision and is OK with possible

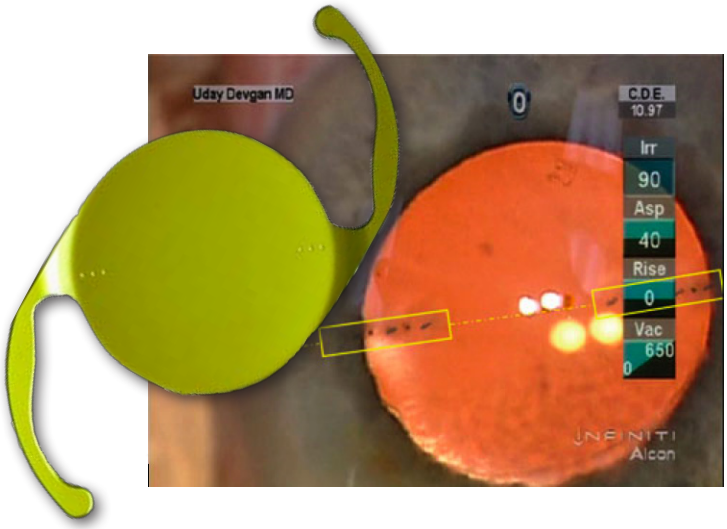

Figure 8A. The Alcon Toric IOL is a single piece acrylic lens with alignment markings that are oriented along the steep corneal meridian.

Figure 8B. The ReSTOR IOL is a single piece acrylic with an aspheric optic that has a central apodized diffractive surface with an outer refractive area

glare at night may be the best candidate for ReSTOR or Technis IOL. A hyperope who wants reading, computer, and distance vision OU may be best treated with Crystalens AO. A myope who wants distance and computer vision, won't tolerate any glare at night, and is OK with wearing light readers for small print may benefit from Crystalens AO as well.

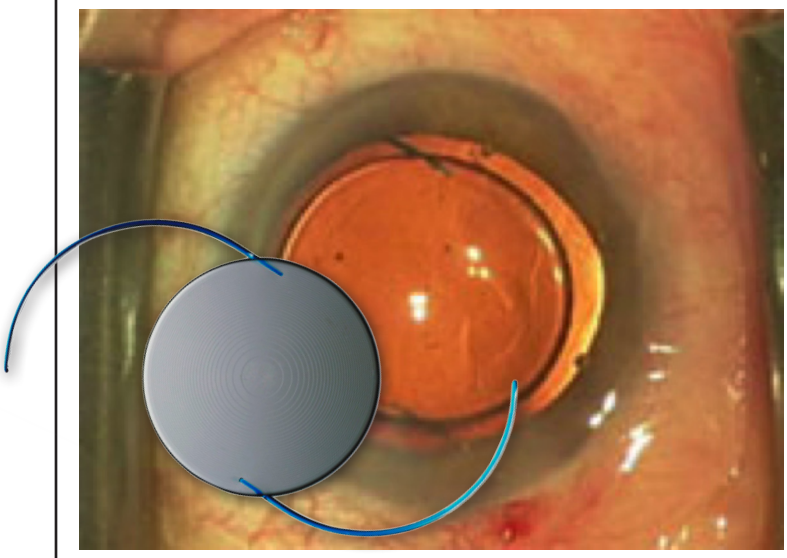

Figure 8C. Technis Multifocal aspheric IOL is available as a 1-piece acrylic lens or a 3-piece acrylic lens with PMMA haptics. Both versions have a posterior diffractive optic.

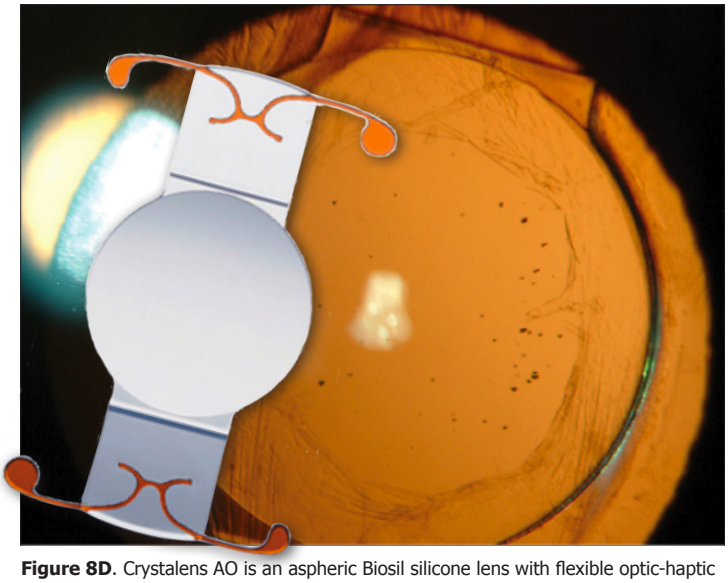

Figure 8D. Crystalens AO is an aspheric Biosil silicone lens with flexible optic-haptic junctions to allow focusing at distance and near.

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3. Refractive Surgery 2010. Refractive Subspecialty Day. American Academy of Ophthalmology, Chicago, IL 2010

Pacific Vision Institute Optometric CE Program

01/11 through 03/11	iFS workshops for co-managing doctors. Pacific Vision Institute, San Francisco, CA
05/06/11	10th Annual San Francisco Continuing Education Symposium Ritz Carlton Hotel, San Francisco, CA

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

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