Slide 1

# NEW TECHNOLOGY RAPID FIRE SESSION

Slide 2

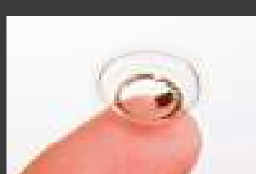
David Geffen, OD, FAAO

*CONSULTANT / INVESTIGATOR for:*

- Accufocus
- Alcon
- AMO
- Annidis
- Bausch + Lomb
- Cooper Vision
- Ocusense
- Optovue
- Ophthonix
- Vistakon
- Vmax
- Wavelight / Allegretto

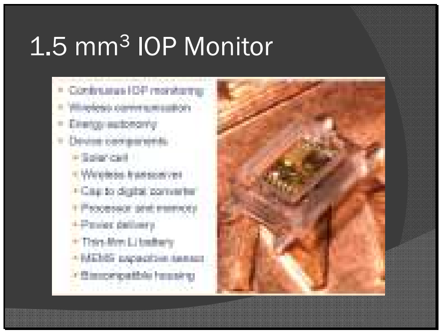
Slide 3

## IOP Sensing



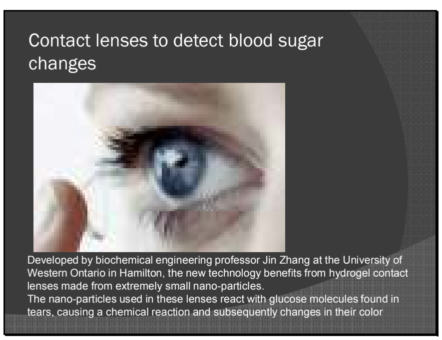
**STMicroelectronics is working with Swiss company Sensimed to develop a contact lens with nano-sensors fabricated in silicon-based MEMS technology which can be used to measure the shape of the human eye and could be used in the early diagnosis of conditions such as glaucoma.**

Slide 4




Slide 5


Slide 6



Slide 7

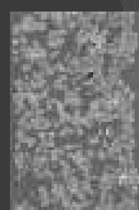
## Photochromic contact lenses

- Nano sized tunnels that can fill with dye
- Faster response than photochromic spectacles

Slide 8

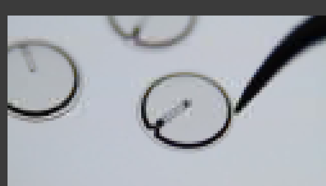
## Drug dispensing contact lenses

- Ciprofloxacin release via a bandage contact lens
- Month or longer drug delivery for other medications



Slide 9

## Microsoft and UW

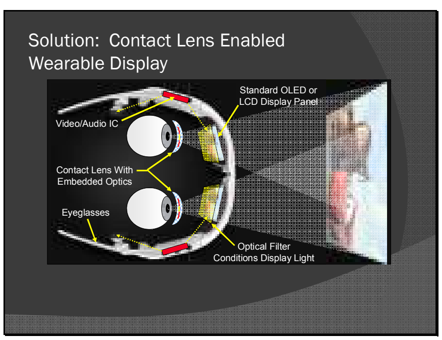


Microsoft and the University of Washington are developing an electronic contact lens that can non-invasively monitor and wirelessly report blood sugar levels

Slide 10


Slide 11


Slide 12

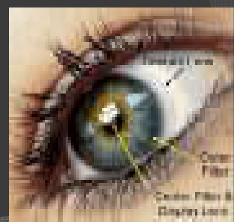


Slide 13

## Innovega Inc. iOptik™ Contact Lens

**Outer lens** sharpens view of normal surroundings (50% of population need corrective lenses)

**Center lens** streams HD/3D Digital Media from eyewear flat-panels or projectors



Slide 14

# VMAX IN PRACTICE

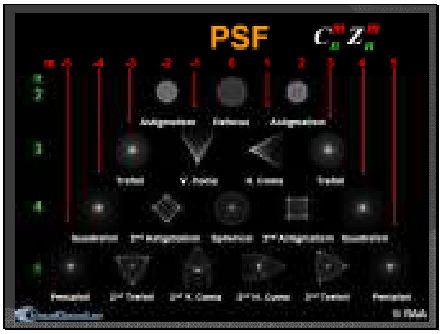
David I. Geffen, OD, FAAO

Slide 15

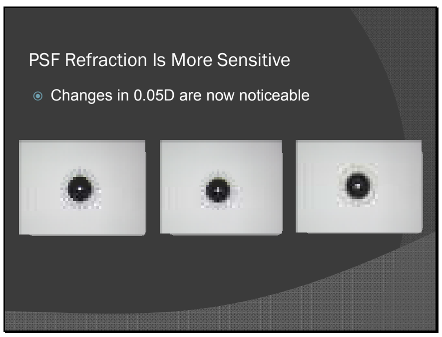
## Refraction

- Over 100 years the same method
- Confusing for the patient
- Inaccurate
- Low Tech

Slide 16




Slide 17




Slide 18

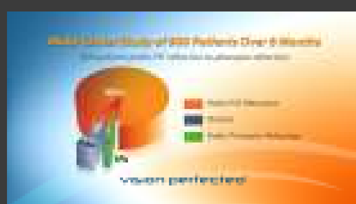
Slide 19

## Practice Benefits

- High Tech Look and Feel
- Get out of the Dark Ages
- Patients hate "Which is Better, One or Two"
- Greater Reliability

Slide 20

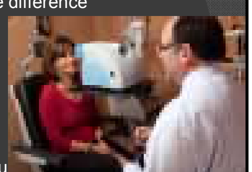
## Results




Slide 21

## Patient Responses

- Easier to tell the difference
- High tech
- Less strain
- Feels more accu



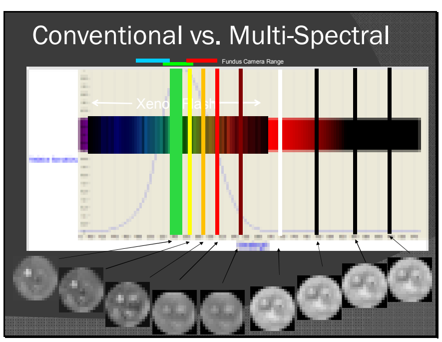
Slide 22


Slide 23

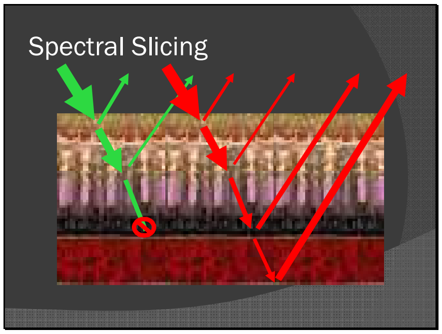
## Multi-spectral Imaging

- Provides progressive views **through** the retina from the ILM to the choroid
- Creates a series of monochromatic ***en face*** **fundus spectral slices** for added diagnostic insight

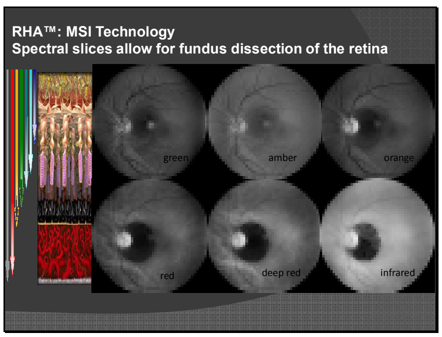
Slide 24



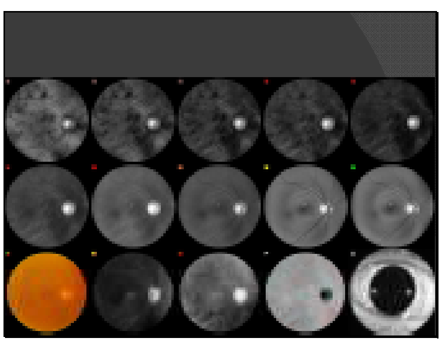
Slide 25



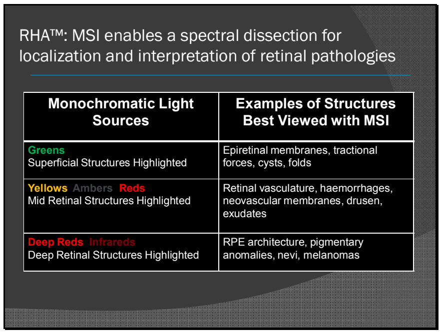

Slide 26




Slide 27

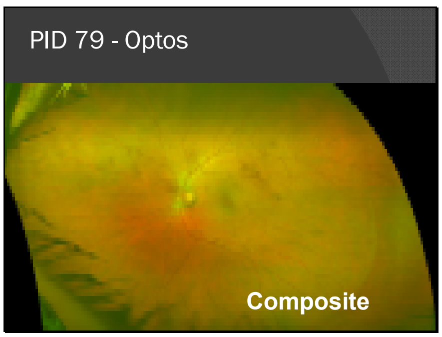


Slide 28

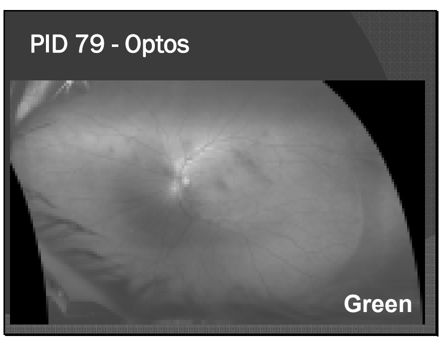

RHA™: MSI enables a spectral dissection for localization and interpretation of retinal pathologies

| Monochromatic Light Sources | Examples of Structures Best Viewed with MSI |
|---|---|
| Greens<br>Superficial Structures Highlighted | Epiretinal membranes, tractional forces, cysts, folds |
| Yellows Ambers Reds<br>Mid Retinal Structures Highlighted | Retinal vasculature, haemorrhages, neovascular membranes, drusen, exudates |
| Deep Reds Infrareds<br>Deep Retinal Structures Highlighted | RPE architecture, pigmentary anomalies, nevi, melanomas |

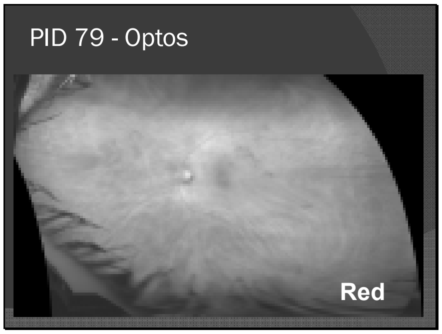
Slide 29



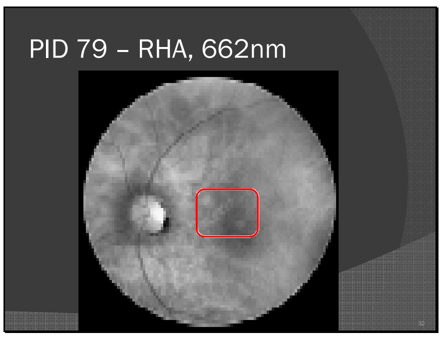

Slide 30



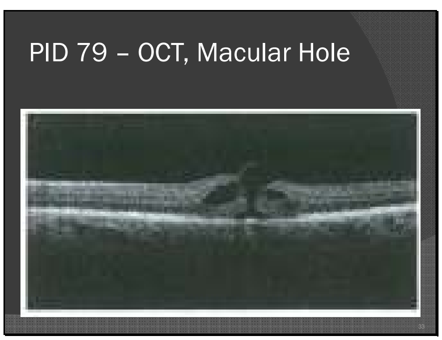
Slide 31



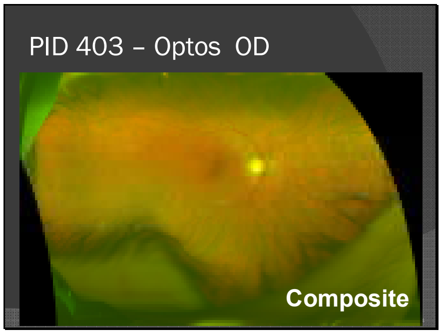

Slide 32



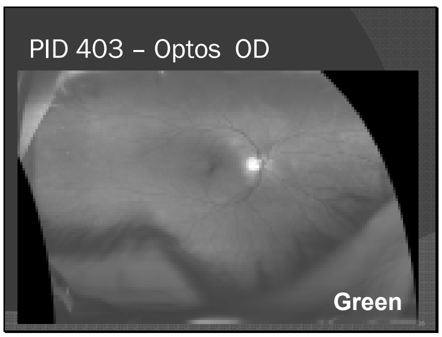

Slide 33



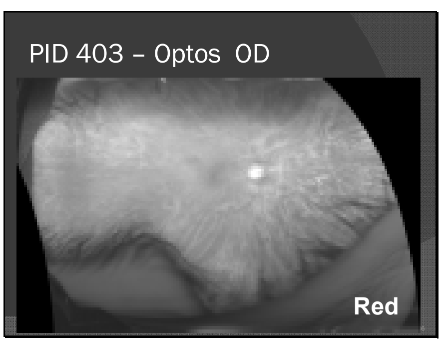
Slide 34



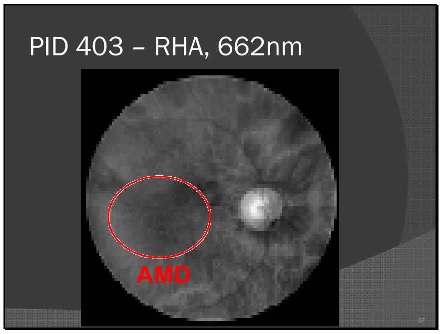

Slide 35



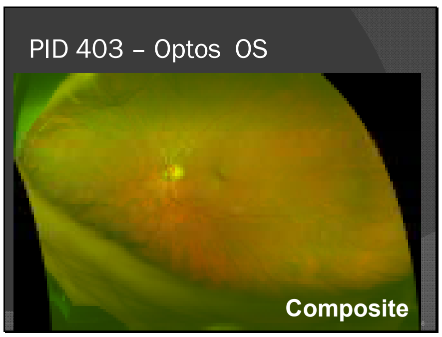

Slide 36



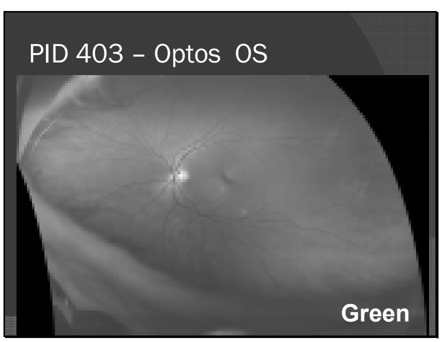
Slide 37



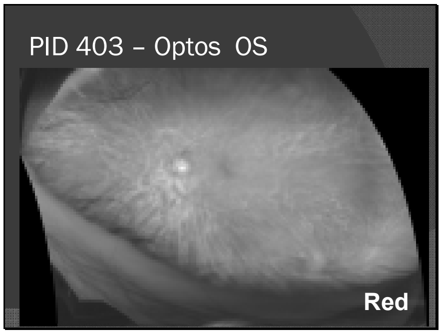

Slide 38



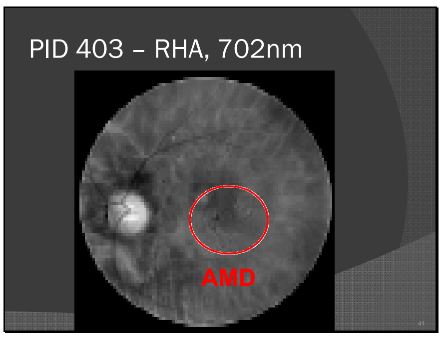

Slide 39



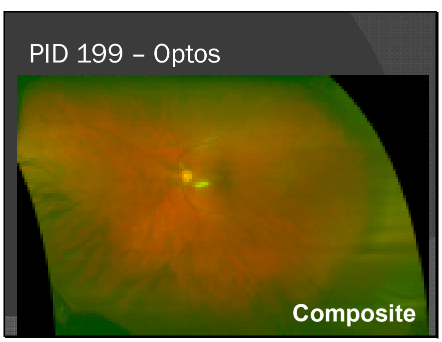
Slide 40



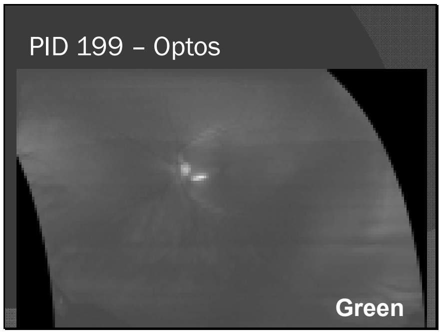

Slide 41



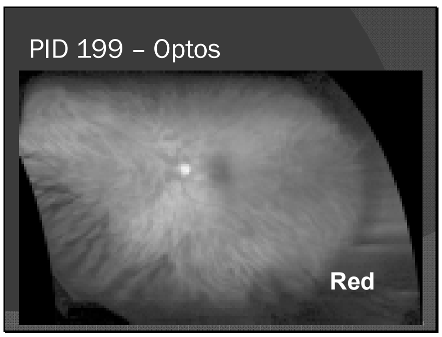

Slide 42



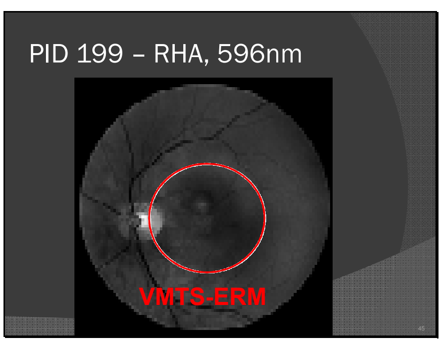
Slide 43




Slide 44




Slide 45



Slide 46

## Return on Investment

- **To date, 18% of my patients screened on the RHA have had suspect areas of interest to pursue further. This has drastically increased the utility of my OCT and I am now selling 4 times more nutriceuticals.**

**Dr. David Geffen**

Slide 47

TearLab

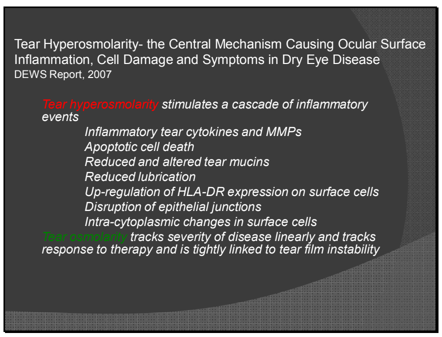
Slide 48

## Technology Overview

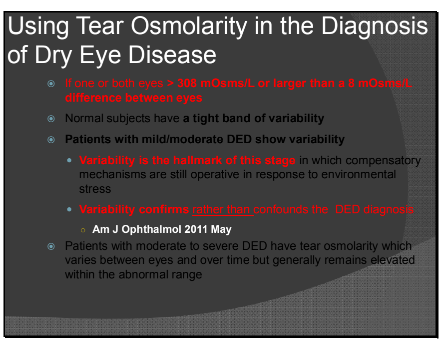
- Revolutionary tear collection
  - Non-invasive
  - Gives access to untrained users (CLIA waiver)
  - Integrates into technician workflow
- Novel lab-on-a-chip
  - Less than 50 nL required
- Platform for rapid electrochemical biomarker assays
  - Sample-to-Answer in less than 30 seconds

Slide 49


Slide 50



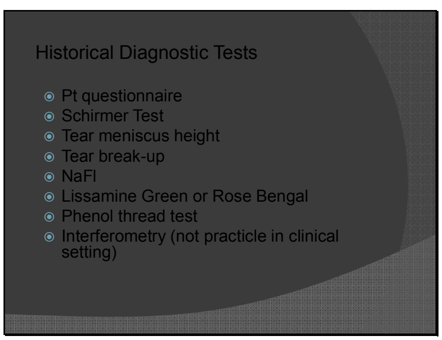

Slide 51



Slide 52


Slide 53


Slide 54



Slide 55

## Osmolarity in the Diagnosis of Dry Eye Disease

| Clinical Test | PPV |
|---|---|
| Osmolarity | 87% |
| Schirmers | 31% |
| TBUT | 25% |
| Staining | 31% |
| Meniscus Height | 33% |

- Osmolarity is the "gold standard" test for Dry Eye Disease
  - 45 years peer reviewed research
  - Osmolarity has been added to definition of Dry Eye
  - Global marker of Dry Eye, indicating a concentrated tear film

Source: DEWS Report, Ocular Surface April 2007 Vol 5 No 2 & Tomlinson A. et. al., IOVS 47(10) 2006

Slide 56

## Diagnose & Classify Patients Quickly

*For more information, see 2007 Report of the Dry Eye WorkShop. Ocul Surf 2007;5[2]:65-204

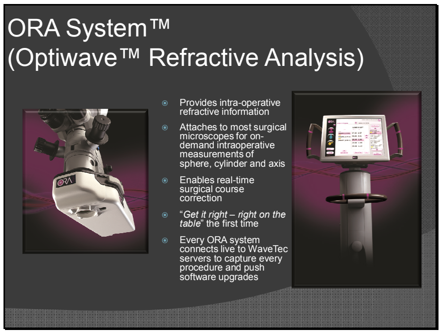
Slide 57

## ORA System™: Designed to Optimize Every Cataract Procedure

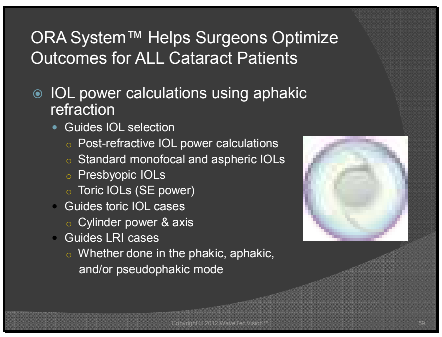
ORA (Optiwave Refractive Analysis)

ORA's all new Optiwave™ technology takes intraoperative wavefront aberrometry to a ***new level of precision*** providing surgeons a ***higher level of confidence***

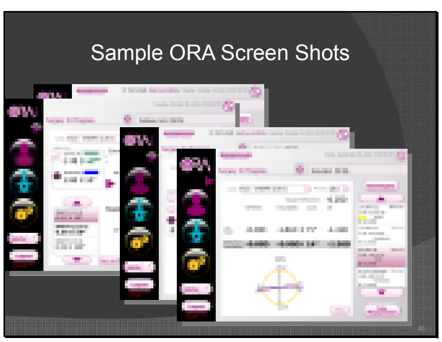
Slide 58



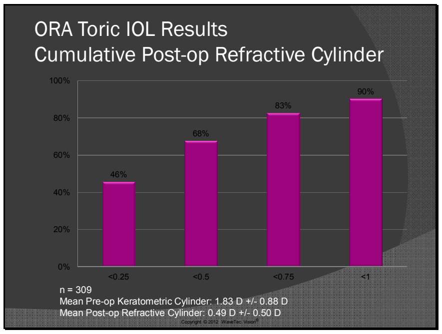

Slide 59



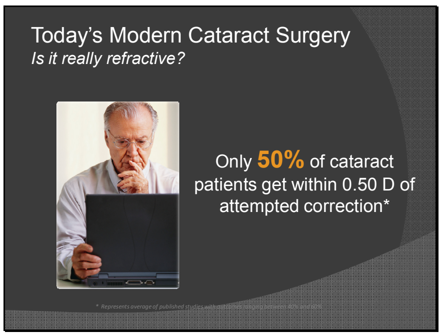

Slide 60



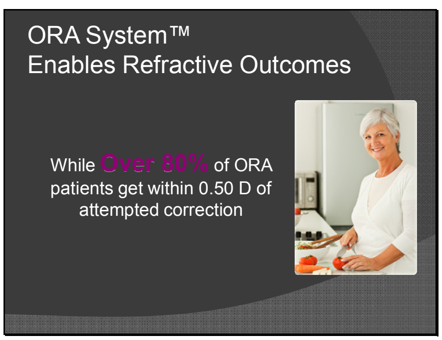
Slide 61




Slide 62




Slide 63



Slide 64

## What to Expect After Surgery – Day One

The vast majority of patients will be seen by the surgeon at day one, but if not:

- Look for a quiet anterior chamber
- Continue prescribed therapy (e.g., antibiotics, steroids, NSAIDs)
- Check ocular surface

Slide 65

## LASER REFRACTIVE CATARACT SURGERY

Slide 66

## Traditional Cataract Surgery

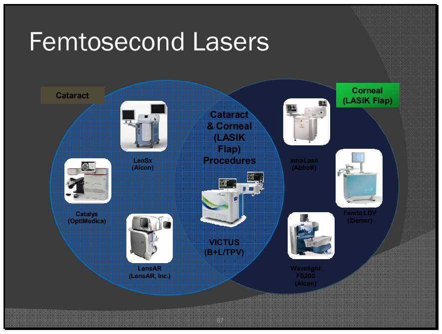
- Capsulotomy size directly related to Effective Lens Position[1,2]
- Corneal incisions are manually executed and imprecise
- High level of phaco power can be associated with post-op complications
- Cataract surgery complications are 10x that of LASIK[3,4]

| Common | Incidence | Vision Threatening | Incidence |
|---|---|---|---|
| Posterior Capsular Opacification | 10-30% | Retinal Detachment | 0.6-1.7 % |
| Cystoid Macular Edema (transient) | 2-10% | Cystoid Macular Edema (persistent) | 1-2% |
| Vitreous Loss | 1-5% | IOL Malposition | 0.3% |
| Corneal Endothelial Cell Loss | 4-10% | Need for Corneal Transplant | 0.3% |
| | | Endopthalmitis | 0.1% |

1. Norrby S. Sources of error in intraocular lens power calculation. *J Cataract Refract Surg*. 2008 Mar;34(3):368-76.
2. Cekiç O, Batman C. The relationship between capsulorhexis size and anterior chamber depth relation. *Ophthalmic Surg Lasers*. 1999 Mar;30(3):185-90.
3. Pereira et al. *JCRS* 2006 Oct;32(10):1661-6
4. Park et al. *Ophthalmic Surg Lasers Imaging*. 2010 Mar-Apr;41(2):236-41

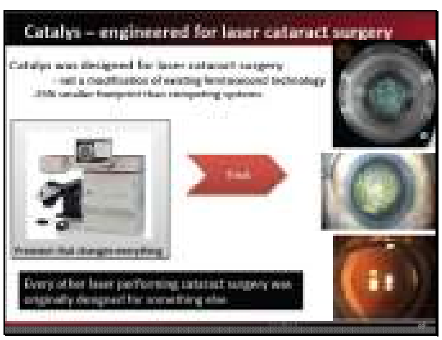
9/23/2013

Slide 67




Slide 68


Slide 69



Slide 70

## The LenSx® Laser

The LenSx® Laser

A dynamic platform technology that will:

- Deliver true refractive cataract surgery with the precision of a femtosecond laser
- Establish **Laser Refractive Cataract Surgery** - a viable new premium category
- Rapidly advance the evolution of true image-guided intraocular surgery
- Advance the development of a more digitized, predictable approach to lens replacement surgery

Slide 71

## Laser Refractive Cataract Surgery

Goal is to Improve Every Procedure, Technology and Surgeon

| Key Step | Current Surgery | Impact | Safety Impact |
|---|---|---|---|
| **Corneal Incision** | Not Optimized | Induced Cylinder | Infection |
| **Capsulorhexis** | Variable Sized, Not Centered | Variable IOL Position & Effective Lens Power | Capsular Tears, Posterior Capsule Opacification |
| **Lens Fragmentation** | Excessive Ultrasound Power | Delayed Visual Recovery | Loss of Endothelial Cells, Capsule Rupture |

Slide 72

## LenSx® Laser Integrated OCT

Image-guided Laser Refractive Cataract Surgery

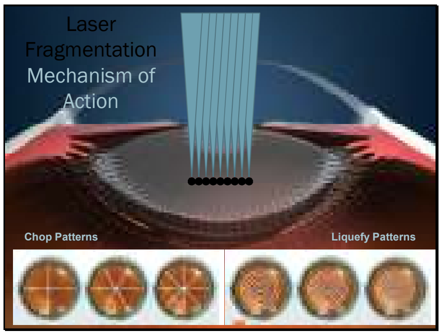
- Intuitive touch screen Graphic User Interface
  - for easy customization of all surgical parameters
- Real-time video imaging for 3D visualization
  - guides the surgeon while docking
  - for optimal surgeon control
- True image-guided surgical planning
  - enables the surgeon to precisely program size, shape, location of each incision

Slide 73

## Traditional Lens Fragmentation

- Initial phaco technique divides the nucleus into quadrants (Divide and Conquer)
  - Endothelium effects
- Variations on this technique were developed to reduce phaco power
  - Chop, Quick Chop, Stop and Chop, Flip, etc.
- Difficult to perform
- Lens density dependent

Slide 74



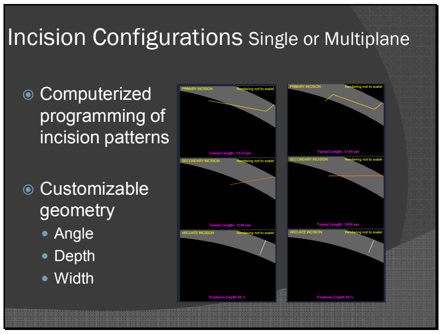

Slide 75

## Manual Clear Corneal Incisions

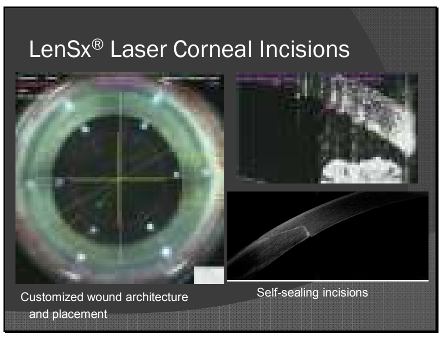
- Wound architecture limited by hand-held instruments, manual incisions
  - imprecise tunnel length and geometry
- Frequently require stromal hydration to seal
- Can result in cascading intraoperative difficulties
  - fluid control, anterior chamber maintenance
- Recent literature suggests an increased incidence of post-op infection[1]
- Incisions may be unstable at low IOPs[2]

[1] Taban M, Behrens A, Newcomb RL, Nobe MY, Saedi G, Sweet PM, McDonnell PJ. Acute endophthalmitis following cataract surgery: a systematic review of the literature. *Arch Ophthalmol.* 2005 May;123(5):613-20.
[2] Behrens A, Stark WJ, Pratzer KA, McDonnell PJ. Dynamics of small-incision clear cornea wounds after phacoemulsification surgery using optical coherence tomography in the early postoperative period. *J Refract Surg.* 2008 Jan;24(1):46-9.

Slide 76




Slide 77




Slide 78

Slide 79

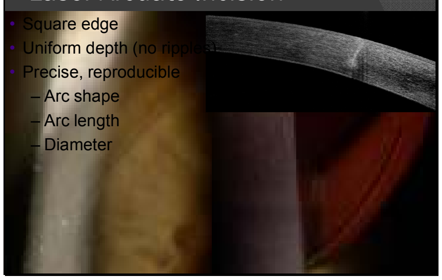
## LenSx® Laser Arcuate Incisions

Image-guided surgical planning with 3D visualization

- Real time corneal thickness
- Computer programmed incisions
  - % depth
  - incision length and position
  - 3D visualization of incision placement
- Predictable incision width, tunnel length
- Titratable incisions
  - adjustable during surgical procedure
  - adjustable post-op at slit lamp

Slide 80

## Laser Arcuate Incision



- Square edge
- Uniform depth (no ripples)
- Precise, reproducible
  - Arc shape
  - Arc length
  - Diameter

Slide 81

## Ideal Capsulorhexis

- Reproducible size, shape and well-centered

Current Manual Capsulorhexis

| Too large | Too small | Irregular shape | Off center |
|---|---|---|---|
| No capsule-IOL overlap | Phimosis | IOL tilt | IOL decentration |
| IOL tilt | Difficult phaco maneuver | IOL decentration | Edge catches visual axis |

Slide 82

## LenSx® Laser Capsulorhexis

- Reproducible, Precise Circular Shape and Diameter Capsulotomy
- Enables Image-Guided Centration of Capsulotomy

Slide 83

## Effective Lens Position (ELPo)

- Assumed value, from empirical data (A constant and surgeon factor)
- A significant source of IOL power error,(Norby, 2008) key to post surgery refraction (Hill, 2009)
- Size of capsulorhexis effects ELPo (Cekic, 1999)

Slide 84

## Patient Expectation

LenSx® Laser technology provides the patient:

- Perceived benefits of a laser procedure
  - Computer controlled precision
  - Procedural predictability
- A comprehensive, advanced technology approach to lens replacement surgery
- A truly premium, value-added surgical experience

Slide 85

## Practice Performance

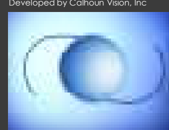
LenSx® Laser technology provides the surgeon:

- Known benefits of femtosecond technology
  - Improved accuracy of all incisions
  - Predictability at every step
- True image-guided intraocular surgery
  - Opportunity to create optimal wound architecture
  - Precise capsulotomy design for every IOL
- A strong value proposition
  - A message that easily resonates with patients and staff

Slide 86

## Standard-Of-Care Technology

Light Adjustable Intraocular Lens (LAL®)
Developed by Calhoun Vision, Inc



- Photosensitive Silicone Material
- Precise, Non-Invasive Post Operative Adjustments
- $\geq$ 2 Diopter Correction for Myopia, Hyperopia, or Astigmatism
- Non-Toxic, Biocompatible
- Foldable

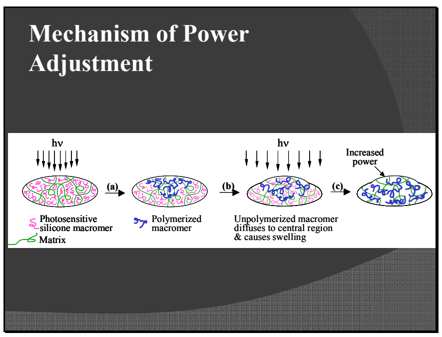
Slide 87

## Why the Light Adjustable Lens?

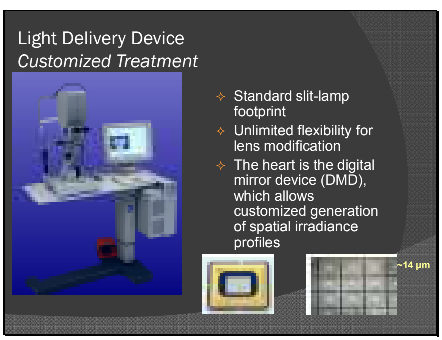
- Predictable correction of residual refractive error *after* lens implantation for optimal distance vision
  - Spherical and cylindrical errors up to 2D
- Customized presbyopia solutions for near and intermediate vision
  - Adjustable Monovision
  - Customized Near Add
  - Asphericity Control

Slide 88

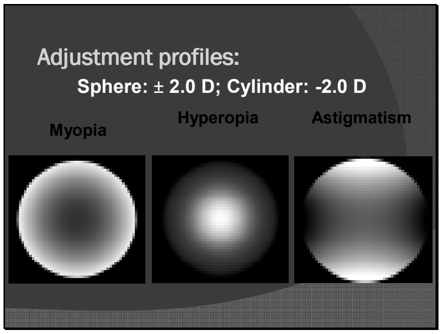

Slide 89



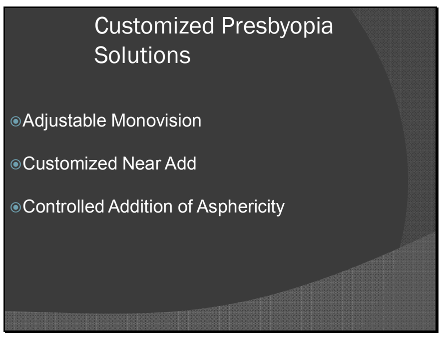

Slide 90



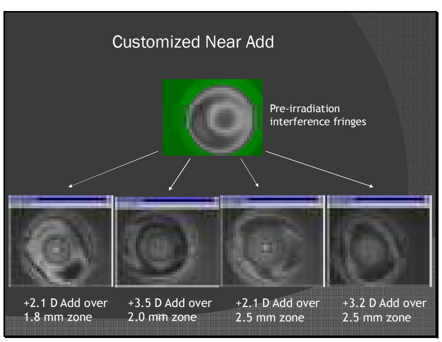
Slide 91




Slide 92




Slide 93



Slide 94

## Control of Asphericity

Induction of positive or negative spherical aberration to increase depth of focus

Slide 95

## *CONCLUSION*
## The Calhoun Vision Light Adjustable Lens

Predictably achieves excellent distance acuity

A variety of options to customize near and intermediate uncorrected acuity

Slide 96

## THANK YOU