# Everything New with IOL and Cataract Surgery

"What an Optometrists Needs to Know"

Jim Owen, OD, MBA, FAAO

## Cataract Surgery

- Eye Care
  - Still the most common eye surgery performed
  - Aging Population makes it even more common
  - Everyone will eventually need it if they live long enough
  - Reimbursement continues to decline

## Current Manual Cataract Surgery


## Limitations of Manual Cataract Surgery

- **Visual Outcomes**
  - Distance Correction Predictability Half that of LASIK
    - Astigmatism Correction
    - Effective Power of IOL
    - Limits Presbyopia Correction
- **Safety**
  - Complications 10x LASIK
- **Surgeon Confidence**
  - Critical for Widespread Adoption
  - Drives Market Growth

| 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% |

## Clinical Applications of a new Femtosecond Laser for Cataract Surgery

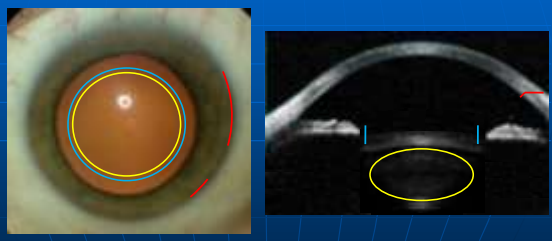
- Liquefy, soften or "chop" the lens
- Create a perfectly centered and sized **Refractive Capsulotomy**
- Create all required **Corneal Incisions** with perfect dimension & architecture
- Provide a refractive solution to pre-existing astigmatism by creating precision **Corneal Incisions**
- Convert a very manual, multi-step, multi-tool procedure to one of laser created, surgeon controlled precision

## LenSx

## Intuitive Software Control Delivers Image-Guided Surgery

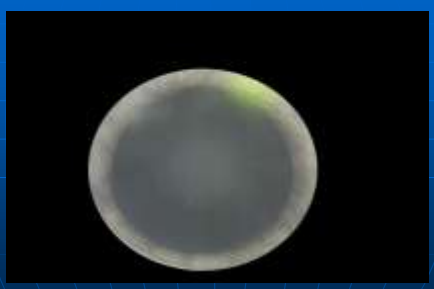
**Procedure Precision & Integration**

## Image- Guided Treatment



## Laser Lens Liquification

## Laser Capsulotomy

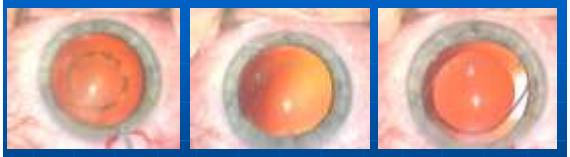


## Goals of Laser Cataract Surgery

- **Improve Every Procedure, Technology and Surgeon**
  - Presbyopia, Astigmatism & Monofocal
  - Refractive Precision and Integration

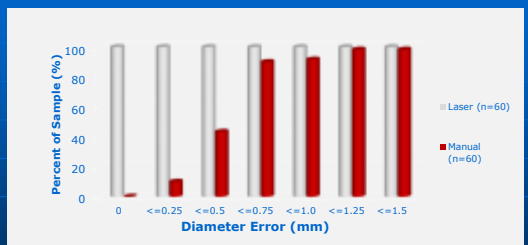
| Key Step | Current Surgery | Refractive Impact | Safety Impact |
|---|---|---|---|
| **Corneal Incision** | Underutilized<br>Not Optimized | Astigmatism | Infection |
| **Capsulorhexis** | Variable Sized,<br>Not Centered | Variable IOL Position &<br>Effective Lens Power | Capsular Tears,<br>Posterior Capsule Opacification |
| **Lens Fragmentation** | Excessive Ultrasound Power | Delayed visual recovery | Loss of endothelial cells,<br>Capsule Rupture |

## Laser Capsulotomy Results



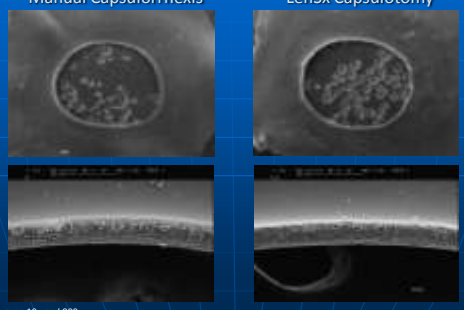
- Perfect centration
- Precision diameter: < ± 0.25 mm
- No radial tears
- Easy and complete removal of capsule
- No adverse events

## Diameter Accuracy



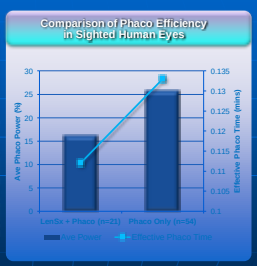

**Two fold reduction in IOL position variability**
**Major opportunity for improvement in refractive correction**

## Capsulotomy SEM




Porcine eyes 10x and 300x

## Corneal Incision and Lens Removal

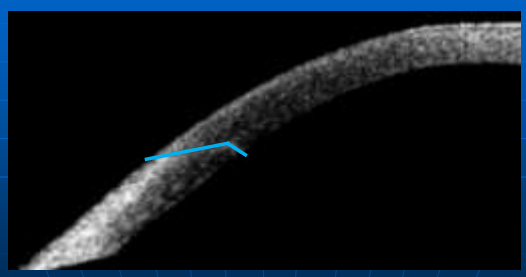




- **Automated reproducibility allows every surgeon to address astigmatism**
- **Reduces or eliminates ultrasound and related complications**

## Two-Plane Corneal Incision

## Intact Wound

## 2 Weeks PostOp OCT



## Conclusions

- Femtosecond laser applications in liquefaction was safe, effective and efficient
- Capsulotomy size, shape and reproducibility was statistically improved over manual techniques
- Corneal incisions were reproducible and had precise dimensions and geometry
- A refractive capsulotomy (perfect shape, size, centration), liquefied lens removal with simple I/A, plus the precision of laser-created corneal incisions may enable surgeons to design and deliver an entirely new level of refractive cataract surgery.

## WaveTec Technology

- The first registered with the FDA for use in cataract surgery
- Introduced to the market April 2009 as the ORange Intraoperative Wavefront Aberrometer
- 2011 made changes/ improvements and introduced at AAO 2011 a new aberrometer
  - 70% of the aberrometer hardware has changed
  - Still utilizes Talbot Moiré interferometry
    - Large dynamic range -5 to +20D
    - The reflected light from the retina (wavefront with aberrations of the eye) passes through a grating pair resulting in a diffractive fringe pattern which is translated into the refractive state of the eye using algorithms
- ORange is now ORA System™ ((Optiwave™ Refractive Analysis)

## 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***

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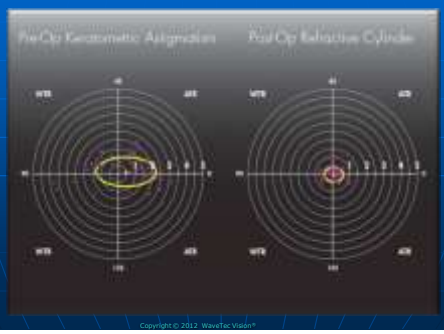
## ORA System™ (Optiwave™ Refractive Analysis)

- Provides intra-operative refractive information
- Attaches to most surgical microscopes for on-demand intraoperative measurements of sphere, cylinder and axis
- Enables real-time surgical course correction
- "*Get it right – right on the table*" the first time
- Every ORA system connects live to WaveTec servers to capture every procedure and push software upgrades

## Sample ORA Screen Shots

## ORA Clinical Data

## ORA Guides Significant Reduction of Astigmatism for Toric IOL Patients

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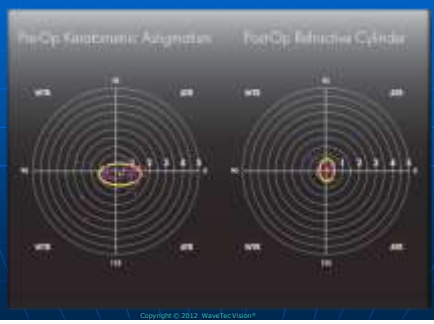
## ORA Guides Significant Reduction of Astigmatism for LRI Patients

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## ORA Optimizes Post-op Outcomes with Extraordinary Accuracy to Target


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## ORA Optimizes Outcomes and Results in Superior Post-op Uncorrected Distance Vision


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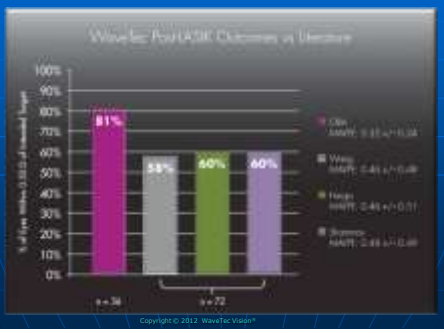
## ORA Outperforms Post-LASIK Patient Outcomes in Literature

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## Review of Clinical Applications

- Provides guidance to improve accuracy in IOL power calculations
  - Aphakic refraction: IOL power calculation
    - Standard and aspheric IOLs
    - Premium IOLs
    - Post-refractive surgery patients
- Provides information to ensure more precise toric IOL outcomes
  - Intraoperative Aphakic Refraction:
    - Spherical power of IOL
    - Aphakic refractive cylinder power and axis
  - Intraoperative Pseudophakic Refraction
    - Guidance for refining toric IOL orientation
      - Placement at the proper axis
- Provides information for more accurate and consistent results when performing LRIs

## Patient Selection

- Pre-operative astigmatism
  - Planned LRI and/or toric IOL
- Post-Refractive
  - LASIK and PRK
- Premium IOLS
  - Accommodating and multi-focal (i.e. Crystalens)
  - Presbyopia treatment
- Standard Mono-focal Patients

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## ORA System's Value to the Practice

- Mitigate risk
- New opportunity to advance & differentiate your practice
- Leverage next-generation technology that help ensure success in complex procedures
- Increase your premium portfolio
- Reduce chair time
- Enhance the satisfaction of your patients

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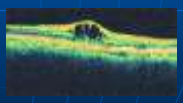
## Conclusions

- The use of the ORA intraoperative aberrometer enables accurate, real-time IOL calculations, creation, and enhancements, of LRIs
- ORA measurements are easily incorporated into the surgical routine, adding minimal time
- ORA improves LRI and IOL power confidence levels and reduces return trips to the OR or laser room for enhancements

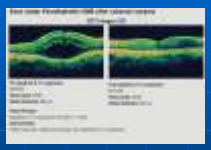
## Cystoid Macular Edema

- Cystoid macular edema (CME) is the most common cause of unexpected visual loss following cataract surgery.
- Fluorescein angiographic CME can occur in up to 50% of patients at 4–8 weeks postoperatively, but clinical CME occurs in less than 3% of patients.
- Fluorescein angiography demonstrates typical petaloid appearance of fluorescein dye leakage during angiography.



## Cystoid Macular Edema

- The typical time of onset of clinical CME is 3–4 weeks postoperatively.
- Predisposing factors are intraoperative complications (e.g., vitreous loss or severe iris trauma), vitreous traction at the wound, diabetic retinopathy, and preexisting epiretinal membrane.



Single perioperative triamcinolone injection versus standard postoperative steroid drops after uneventful phacoemulsification surgery

Randomized controlled trial

## CME

- The routine use of nonsteroidal anti-inflammatory drugs before surgery is recommended by many surgeons. Multiple studies have demonstrated the anti-inflammatory effect of these drugs, and with an already compromised blood aqueous barrier and increased risk for postoperative inflammation, nonsteroidal anti-inflammatory drugs have proved to decrease the risk of CME. Additionally, these drugs help to prolong the mydriatic effect of perioperative dilating drops.
- Continue for 2-4 weeks

MAJOR REVIEW

**Nonsteroidal Anti-inflammatory Drugs in Ophthalmology**

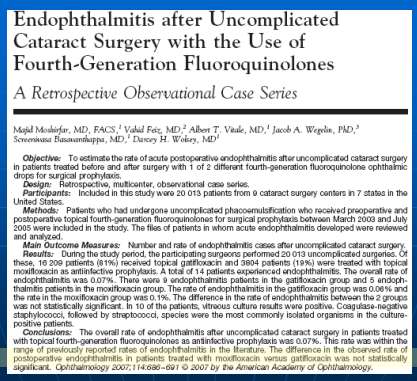
Stephen J. Kim, MD,[1] Alan J. Flach, MD,[2] and Lee M. Jampol, MD[3]

## Major Review



## Endophthalmitis

- It is characterized by ciliary injection, conjunctival chemosis, hypopyon, decreased visual acuity, and ocular pain. The acute form generally develops within 2–5 days of surgery.
  - Common causative organisms are gram-positive, coagulase-negative micrococci, *Staphylococcus aureus*, streptococcus species, and enterococcus species.
- Chronic endophthalmitis is caused by organisms of low pathogenicity, such as *Propionibacterium acnes* or *Staphylococcus epidermidis*. It typically is diagnosed several weeks or longer after surgery. Signs include decreased visual acuity, chronic uveitis with or without hypopyon formation, and, in some instances, plaque-like material on the posterior capsule. Histopathologically, this material consists of the offending microorganism embedded in residual lenticular tissue.
  - Treatment of endophthalmitis consists of culturing aqueous and vitreous aspirates, followed by administration of intravitreal, topical, and subconjunctival antibiotics
  - In the Endophthalmitis Vitrectomy Study, no evidence was found of any benefit from the use of systemic antibiotics. Pars plana vitrectomy helped increase the final visual outcome only of those patients who had an initial visual acuity of light perception or worse



**Endophthalmitis after Uncomplicated Cataract Surgery with the Use of Fourth-Generation Fluoroquinolones**

*A Retrospective Observational Case Series*

Majid Moshirfar, MD, FACS,[1] Vahid Feiz, MD,[2] Albert T. Vitale, MD,[1] Jacob A. Wegelin, PhD,[3] Sreenivasa Basavanthappa, MD,[1] Darcey H. Wolsey, MD[1]

***Objective:*** To estimate the rate of acute postoperative endophthalmitis after uncomplicated cataract surgery in patients treated before and after surgery with 1 of 2 different fourth-generation fluoroquinolone ophthalmic drops for surgical prophylaxis.

***Design:*** Retrospective, multicenter, observational case series.

***Participants:*** Included in this study were 20 013 patients from 9 cataract surgery centers in 7 states in the United States.

***Methods:*** Patients who had undergone uncomplicated phacoemulsification who received preoperative and postoperative topical fourth-generation fluoroquinolones for surgical prophylaxis between March 2003 and July 2005 were included in the study. The files of patients in whom acute endophthalmitis developed were reviewed and analyzed.

***Main Outcome Measures:*** Number and rate of endophthalmitis cases after uncomplicated cataract surgery.

***Results:*** During the study period, the participating surgeons performed 20 013 uncomplicated surgeries. Of these, 16 209 patients (81%) received topical gatifloxacin and 3804 patients (19%) were treated with topical moxifloxacin as antiinfective prophylaxis. A total of 14 patients experienced endophthalmitis. The overall rate of endophthalmitis was 0.07%. There were 9 endophthalmitis patients in the gatifloxacin group and 5 endophthalmitis patients in the moxifloxacin group. The rate of endophthalmitis in the gatifloxacin group was 0.06% and the rate in the moxifloxacin group was 0.1%. The difference in the rate of endophthalmitis between the 2 groups was not statistically significant. In 10 of the patients, vitreous culture results were positive. Coagulase-negative staphylococci, followed by streptococci, species were the most commonly isolated organisms in the culture-positive patients.

***Conclusions:*** The overall rate of endophthalmitis after uncomplicated cataract surgery in patients treated with topical fourth-generation fluoroquinolones as antiinfective prophylaxis was 0.07%. This rate was within the range of previously reported rates of endophthalmitis in the literature. The difference in the observed rate of postoperative endophthalmitis in patients treated with moxifloxacin versus gatifloxacin was not statistically significant. *Ophthalmology 2007;114:686–691* *© 2007 by the American Academy of Ophthalmology.*

CLINICAL SCIENCES

**Acute Endophthalmitis Following Cataract Surgery**

***A Systematic Review of the Literature***

*Mehran Taban, MD; Ashley Behrens, MD; Robert L. Newcomb, PhD; Matthew Y. Nobe; Golnaz Saedi, BS; Paula M. Sweet, MT; Peter J. McDonnell, MD*

**Objectives:** To determine the reported incidence of acute endophthalmitis following cataract extraction over time and to explore possible contributing factors, such as type of cataract incision.

**Methods:** A systematic review of English-language articles was conducted by performing a broad search of PubMed from 1963 through March 2003 using such terms as *cataract extraction*, *endophthalmitis*, and *postoperative complication*.

**Conclusions:** This systematic review indicates that the incidence of endophthalmitis associated with cataract extraction has increased over the last decade. This upward trend in endophthalmitis frequency coincides somewhat with the introduction of intraocular lens implantation during cataract surgery.

## Endophthalmitis risk

The clear corneal incisions commonly used for phacoemulsification are associated with a significantly increased risk of endophthalmitis, compared to **scleral tunnel incisions** (5.8 fold increase)

J Cataract Refract Surg. 2004 Sep;30(9):1953-9.
**Prevention of endophthalmitis.**

Eye (Lond). 2007 May;21(5):580-6. Epub 2006 Jul 7.
**Presumed infectious endophthalmitis following cataract surgery in the UK: a case-control study of risk factors.**

J Cataract Refract Surg. 2007 Jun;33(6):978-88.
**Prophylaxis of postoperative endophthalmitis following cataract surgery: results of the ESCRS multicenter study and identification of risk factors.**

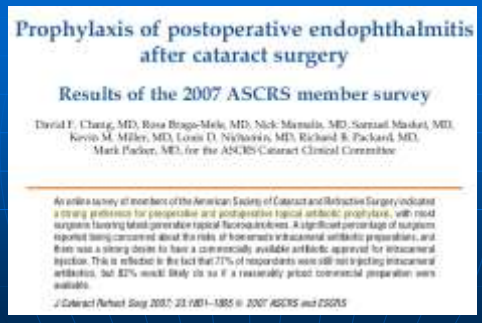
**instillation of topical 5% povidone-iodine** (Betadine) into the conjunctival sac prior to surgery significantly reduces the risk of endophthalmitis; this has become accepted preoperative practice. The antimicrobial effect of povidone-iodine occurs within one minute of irrigation; it kills 96.7% of bacteria and lasts for at least one hour. Povidone iodine appears to be more effective in reducing infection than preoperative antibiotics.

Ophthalmology. 1999 Oct;106(10):1869-77.
**Endophthalmitis in cataract surgery: results of a German survey.**

Surgical complications, in particular a torn posterior lens capsule, can significantly increase the risk of endophthalmitis

Eye (Lond). 2007 May;21(5):580-6. Epub 2006 Jul 7.
**Presumed infectious endophthalmitis following cataract surgery in the UK: a case-control study of risk factors.**

J Cataract Refract Surg. 2007 Jun;33(6):978-88.
**Prophylaxis of postoperative endophthalmitis following cataract surgery: results of the ESCRS multicenter study and identification of risk factors.**
Endophthalmitis Study Group, European Society of Cataract & Refractive Surgeons



Prophylaxis of postoperative endophthalmitis after cataract surgery

Results of the 2007 ASCRS member survey

David F. Chang, MD, Rosa Braga-Mele, MD, Nick Mamalis, MD, Samuel Masket, MD, Kevin M. Miller, MD, Louis D. Nichamin, MD, Richard B. Packard, MD, Mark Packer, MD, for the ASCRS Cataract Clinical Committee

An online survey of members of the American Society of Cataract and Refractive Surgery indicated a strong preference for preoperative and postoperative topical antibiotic prophylaxis, with most surgeons favoring third-generation topical fluoroquinolones. A significant percentage of surgeons reported being concerned about the risks of intracameral antibiotic preparations, and there was a strong desire to have a commercially available antibiotic approved for intracameral injection. This is reflected in the fact that 71% of respondents were still not injecting intracameral antibiotics, but 82% would likely do so if a reasonably priced commercial preparation were available.

J Cataract Refract Surg 2007; 33:1801–1805 © 2007 ASCRS and ESCRS

## Premium IOL's

## Treat Astigmatism at the Time of Surgery

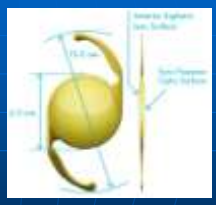
**The AcrySof® IQ Toric IOL offers cataract surgery patients with astigmatism:**

- Reduction of residual refractive cylinder
- Improved uncorrected distance visual acuity
- Increased spectacle-independent distance vision

## The Next Step in Toric Technology

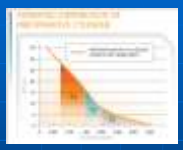
**The AcrySof® IQ Toric IOL:**

- Builds on a long line of innovation from Alcon
- Takes the trusted platform for precise astigmatism correction and adds the enhanced image quality of an aspheric lens



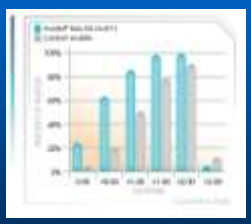
## Designed for a Wide Range of Astigmatic Patients

- AcrySof® IQ Toric IOL is designed to accommodate a variety of cataract patients with astigmatism



- A wide range of cylinder powers means more candidates can benefit from AcrySof® IQ Toric IOL

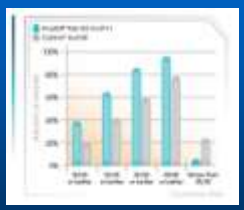
## Dramatically Reduces Residual Refractive Cylinder



- 63% of patients achieved ≤0.50 diopters of residual refractive cylinder[1]
- 87% of patients achieved ≤1.00 diopters of residual refractive cylinder[1]

[1]AcrySof® IQ Toric IOL Package Insert.

## Improves Uncorrected Distance Visual Acuity



- 94% of patients implanted achieved uncorrected distance visual acuity of 20/40 or better[1]

[1]AcrySof® IQ Toric IOL Package Insert.

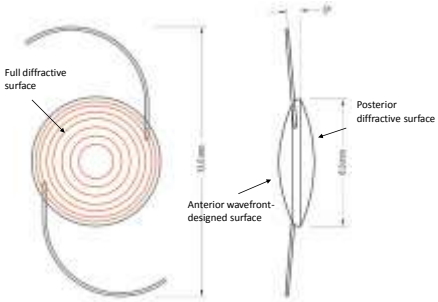
## Patient Expectations

- What they say is "I want to be able to read"
- What they want is **Accommodation**

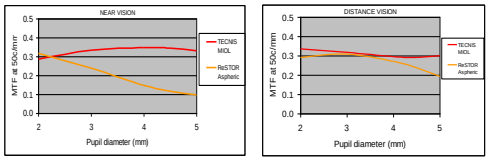
## The Center of a Presbyope's World

## Forget Most Everything!


## The TECNIS® Multifocal IOL




## Full Diffractive Surface=Pupil Independence




Data on File. Advanced Medical Optics, Inc.

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## US Clinical Results

Study Parameters:

- One year, multicenter, evaluator-masked comparative clinical evaluation
- Conducted at 13 investigational sites
- Enrolled: 121 bilateral multifocal and 122 bilateral monofocal subjects
- Bilateral results at 1 year presented for 114 multifocal subjects
- Subject assignment was not randomized
  - Based on patient's choice for a multifocal or monofocal

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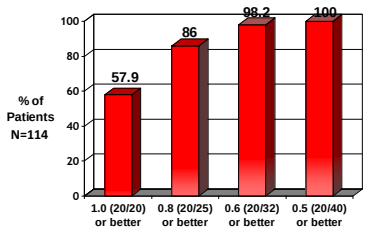
## US Clinical Results

**Uncorrected binocular distance visual acuity**

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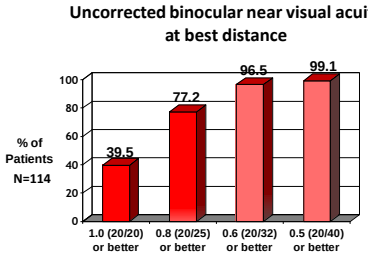
## US Clinical Results

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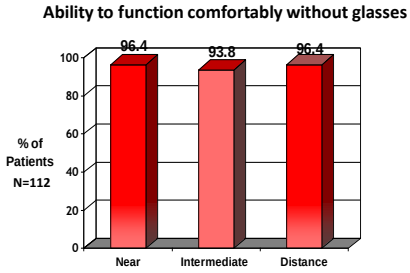
## US Clinical Results

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## The TECNIS® Multifocal IOL

- Designed to reduce spherical aberration to zero and correct chromatic aberration in all light conditions
- Superior near and far low-light vision
- Superior near and far bright-light vision
- Faster near and intermediate reading speed
- Extremely high spectacle independence and patient satisfaction
- Does not block blue light

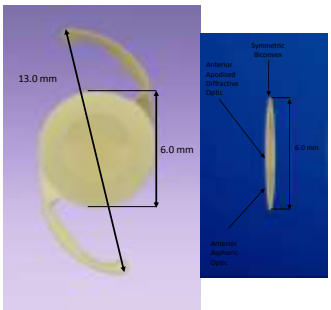
## ReSTOR
## Apodized Diffractive Refractive

Multifocal lens with a multifocal center

Diffractive/Refractive

Acrylic material

## Anatomy of the Apodized Diffractive Technology




## AcrySof® IQ ReSTOR® IOL

SN6AD3

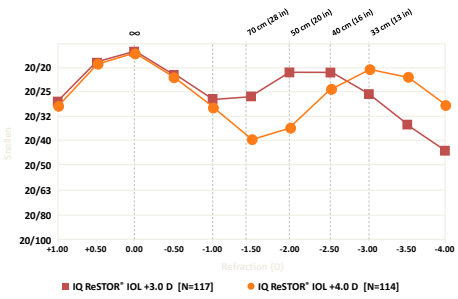
Add Power: **+4.0 D**
Spectacle Plane: +3.2 D
Range: +10.0 D to +34.0 D
A-Constant: 118.9

SN6AD1

Add Power: **+3.0 D**
Spectacle Plane: +2.5 D
Range: +10.0 D to +34.0 D
A-Constant: 118.9

67

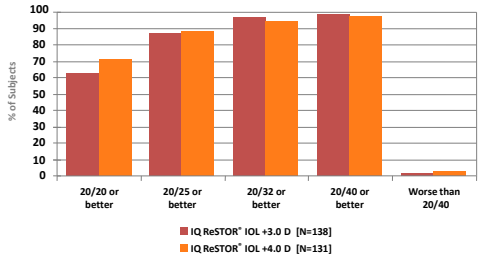
## Binocular Defocus Curve




68

## Uncorrected Binocular Photopic Distance VAs

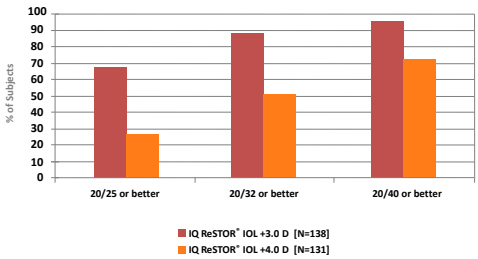
**All Implanted, 3 month postoperative, Cumulative**




69

## Uncorrected Intermediate Photopic VAs

**All Implanted, 3 month postoperative, 50 cm**

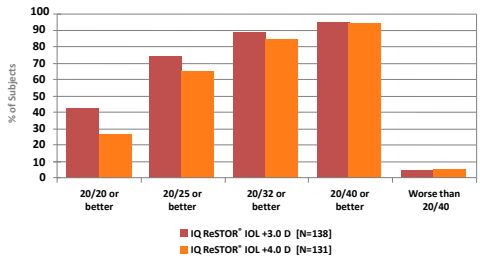



Provides a one line or more improvement in binocular intermediate VA.

70

## Uncorrected Binocular Photopic Near VAs

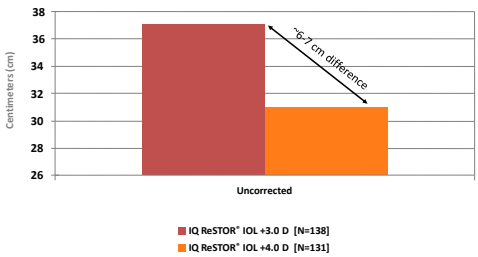
**All Implanted, 3 month postoperative, Cumulative, Standard Distance**




Standard distance: 33 cm for Model SN6AD3 and 40 cm for Model SN6AD1

71

## Average Near Best Distance




72

## Observations with Plate IOLs
## Stuart Cumming 1989

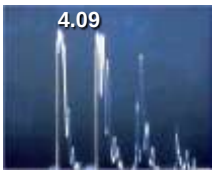
- Some plate haptic IOL patients are still able to read well even after eliminating pseudoaccommodative factors such as
  - Residual myopia
  - Residual astigmatism

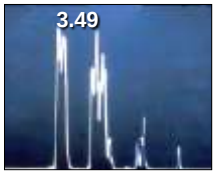
Loop Haptic

Plate Haptic

## Thornton 1986
## Current Canadian Ophth.Pract.

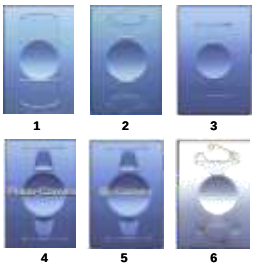
- A-Scan demonstrated shallowing of anterior chamber after movement of three piece loop lens with accommodation




## Early Clinical Evaluations

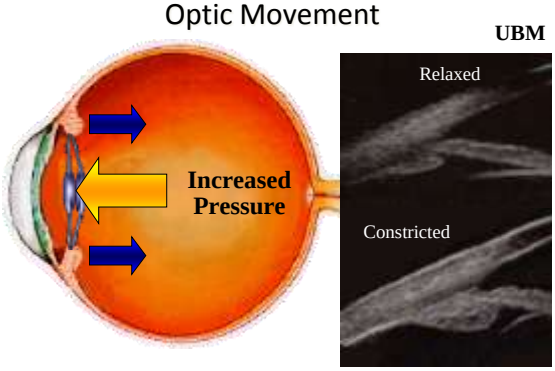
- The first Crystalens AIOL was implanted in England in 1991
- 6 lens designs implanted over 9 years
- Summary:
  - All models accommodated
  - All models had some anterior dislocations




## Crystalens® AT-45
## The First FDA Approved Accommodating IOL Nov. 2003

- Hinged optic to increase movement
- Lengthened haptics to maximize amplitude
- 4.5 mm optic to maintain 10.5mm plate length
- 11.5 mm overall length

## Primary Mechanism
## Optic Movement

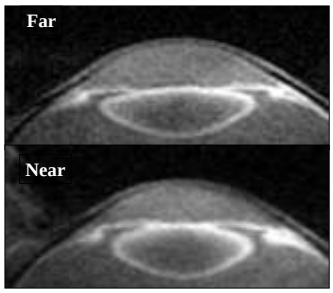



## Secondary Mechanism
## Accommodative Arching

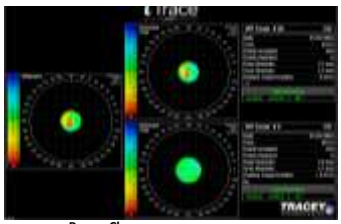
## Summary of Wavefront Findings crystalline Lens


- Power Change
  - Greater in the center
  - Less in the peripheral
  - Generally greater than the change in SE
- Aberration
  - Increase in negative spherical aberration
  - Increase in coma

## MRI Changes to the Lens




## Summary Of Wavefront Findings Crystalens®

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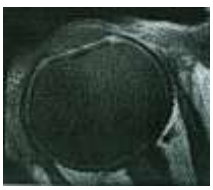
## MRI Changes to Optic



Distance

Near

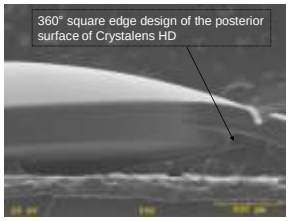
# Crystalens HD

- Approved by the FDA in July 2008 and CE marked in August 2008
- Follows 3 generations of FDA approved accommodating intraocular lens(4th generation)
- First generation FDA approved in 2003
- Fastest growing PCIOL implanted in the US

# Crystalens HD Properties

- Made of a 3rd generation silicone material called Biosil
- Modified plate-style implant with a 5 mm optic
- (Available in two overall lengths
  - 11.5 mm for powers 17.0 D and higher
  - 12.0 mm for powers below 17.0 D)

## Crystalens HD Properties




- Optic has a 360° square edge design to impede posterior capsule opacification
- Depth of Crystalens HD central optic is slightly thicker than previous models enhancing the central power change that is observed when the Crystalens accommodates

## Alcon AcrySof TORIC IOL

- Toric optic in single-piece SA60 carrier
- Approved 9/05
- Available 3/06

## Alcon Toric IOL (SN6AT3,4,5)

- Blue light blocking platform
- Biconvex, aspheric optic
- Helpful online toric calculator
- Comes in three cylinder powers
  - 1.5, 2.25, and 3D
- Achieves in the eye
  - (.75 to 1.5D), (1.5 to 2D), or 2D+
- Mark axis prior to reclining patient
- Stays on axis very well

## Patient Questions

- Are you interested in spectacle-free vision after your cataract surgery?
- Would you tolerate some glare/halo at night?
- Would you be willing to pay an addition fee out-of-pocket for this technology?

Our goal is to ***reduce*** your dependence on spectacles!

## Important Points

- Co-management arrangements must be based on the surgeon's portion of the total fee
  - Typically ASC charges are not part of the arrangements
- Arrangements must be based on procedures performed by the each provider

## Informed Consent

- Don't pre-judge affordability
- Describe all options
- Make specific recommendation
- Involve family member or friend
- Use visual props to explain IOL and possible visual side effects

## 1st Eye

- Worst eye
  - Loss of BCVA

Or

- Non-Dominant eye

## 2nd Eye

- Wait 2-4 weeks
- Check refractive target of 1st eye
- Review surgical plan
- Modify surgical plan bases on 1st eye outcome

## Your Choice of IOL

- Patient Expectations
- Patients Needs
- Patients Adaptability
- Patients Risk Tolerance

## Patient Profile

Decide on Goal Refraction

MEC Questionnaire

Cataract Surgery

3 steps:

1. Distance Interests
2. Near Interests
3. Tolerance for Frustration

Date Name Date of Birth

Options for Lens Implants

When a cataract is removed, an artificial lens is placed inside the eye to take the place of the human lens that is removed. Close lenses that have not yet developed cataracts are also sometimes replaced with an artificial lens to reduce the need for glasses or contacts. This questionnaire will assist us in providing the treatment best suited for your visual needs if it is determined that surgery is appropriate for you. It is important that you understand that many patients will need to wear glasses for some activities after surgery and that vision can not be perfect for all situations.

1. How interested are you in seeing at a distance without glasses after surgery?

___Prefer no distance glasses

___Not important to me. I don't mind wearing distance glasses.

1. How important is it to you to see up close (reading) without glasses after surgery?

___Prefer no reading glasses

___Not important to me. I don't mind wearing reading glasses.

1. If you could have good vision for driving during the day without glasses, and good vision without glasses to most situations, would you be able to tolerate some halos and glare around lights at night as well as use glasses for some situations?

___Yes

___No

## Exclusion Criteria

- Macular pathologies, glaucoma with severe visual field loss
- Expected astigmatism >1.5 D*
- Expected myopia >0.5 D
- Unrealistic visual expectations
- Happy with reading glasses
- Surgical complications, such as capsulorhexis tear, capsular folds, fixation in sulcus
- Patient is at risk for developing PCO

## Astigmatism correction

- Limbal Relaxing incisions (LRI)
  - Done at time of IOL implant
- LASIK / PRK
  - Done after lens implant Sx
  - PRK can be as soon as 6 weeks
  - Lasik → 3 months


## 3 Areas of Vision

- Distance
- Intermediate
- Near
- Rate them in order of importance to you

## 5 Key Criteria

- ***Age*** – residual accommodation
- ***Refractive Astigmatism***
- ***Pupil size*** - scotopic/mesopic
- ***Area of Vision*** – Order of Importance
- ***Personality Type*** - Expectations

## Age

- < than 50 years
  - Crystalens
  - Aspheric monofocal
- > 50 yrs
  - All

## Refractive Astigmatism

- < than 1D
  - Accommodative IOL
  - Multifocal IOL
  - Monofical IOL
- 1D or more
  - Toric IOL
  - Bioptics
    - LASIK/PRK
    - LRI/AK

## Pupils Size - mesopic

- 3.0mm or less
  - Crystalens
  - Monofocal
- 3.0mm – 5.0mm
  - ReStor
  - Tecnis
  - Crystalens
  - Monofocal
- Greater than 5.0mm
  - ReStor
  - Tecnis
  - Crystalens
  - ReZoom
  - Monofocal

## Area of Vision

- **DV-IV-NV**
  - Crystalens
  - ReZoom*
  - Monofocal
    - Monovision
    - Spectacles
- **DV-NV-IV**
  - ReStor 3.0
  - Tecnis
  - Monofocal
    - Monovision
    - Spectacles
- **NV–DV–IV**
  - ReStor 3.0
  - Tecnis
  - Monofocal
    - Spectacles
    - Monovision
- **NV-IV-DV**
  - ReStor 3.0/4.0
  - Monofocal
    - Monovision
    - Spectacles
  - ReStor/ReZoom
- **IV-NV-DV**
  - ReStor 3.0/4.0
  - Crystalens
    - Myopic target
    - Distance Spectacle
  - Monofocal
    - Monovision or myopic target OU
    - Spectacles
- **IV–DV–NV**
  - Crystalens
  - ReZoom
  - Monofocal
    - Spectacles
    - Monovision

## Personality Type

- 1-3 ***Easy going***
  - ReStor
  - Tecnis
  - Monofocal
- 4-7 ***Middle of the road***
  - Crystalens
  - ReStor
  - Tecnis
  - Monofocal
- 8-10 ***Perfectionist***
  - Crystalens
  - Monofocal

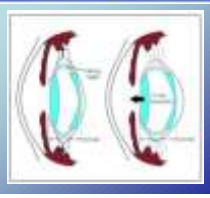
## Other options?

- Aspherics
- Monovision
  - Modified monovision
- Bioptics
  - PRK/LASIK
  - LRI/AK
- Mix and Match
- Spectacles!

## Future Accommodating IOLs

## Visiogen Synchrony

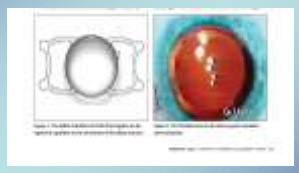
- Dual Optic
  - Minus power posterior lens
  - Plus power anterior lens
- Distance between optics increases with accommodative effort
- Approval: Dec 2009–March 2010
- Patent issues could arise

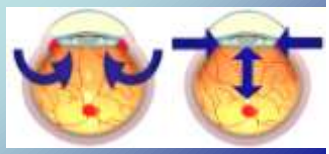


Synchrony.wmv

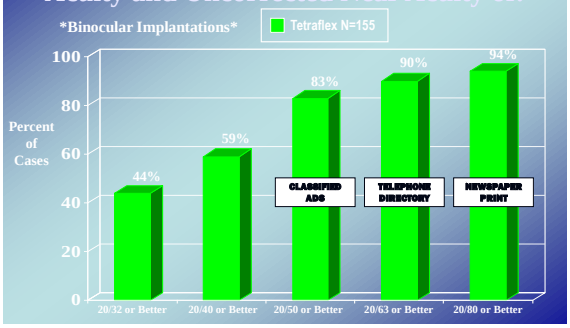
## Lenstec Tetreflex

- Monofocal Design
- Translating optic
- Patent issues could arise





## Spectacle Independence: Proportion of Cases with 20/25 or Better Uncorrected Distance Acuity and Uncorrected Near Acuity of:



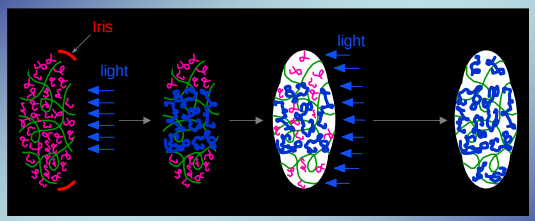

## Clinical Results With the Light Adjustable Intraocular Lens After Cataract Surgery

*J Refract Surg*. 5/2010;26:314-320

## What If You Could Change The Power Of An IOL and Treat High Order Aberrations After Implantation?

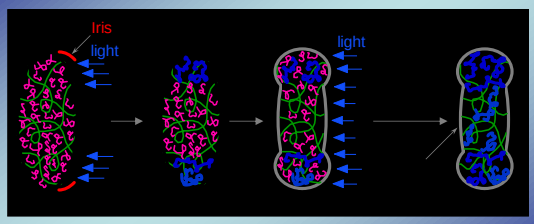
## Light Delivery Device

## *Adding Power to the LAL*




**=> change in radii of curvature => change in power**

## Subtracting Power from the LAL




**=> change in radii of curvature => change in power**

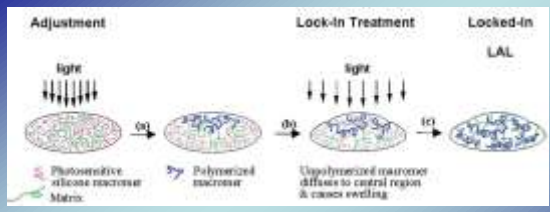
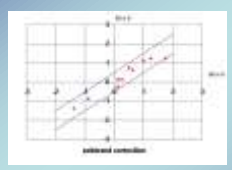
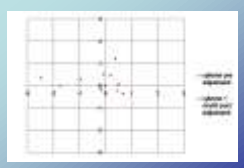



**Figure 1. Schematic of the positive power adjustment mechanism. A) Adjustment: selective irradiation of the central zone of the light adjustable lens (LAL) polymerizes the macromer, creating a difference in the chemical potential between the irradiated and nonirradiated regions. B) To re-establish equilibrium, the excess macromer diffuses into the irradiated region causing swelling. C) Lock-in Treatment: irradiation of the entire LAL "locks" the remaining macromer so that no further change of refraction is possible.**





**1 month post op**

## Summary

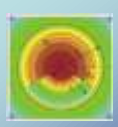
- Silicone Light Adjustable IOLs
  - Myopic, hyperopic, and astigmatic errors
  - Custom Wavefront
  - Platform:, Phakic IOL, Multifocal or Accommodative IOL, Injectable IOL

ARTICLE IN PRESS

Clinical Evaluation of an Ultraviolet Light Adjustable Intraocular Lens Implanted after Cataract Removal

Eighteen Months Follow-up

## Surface Embedded Near Section



## Lentis Mplus

- Independent of pupil size greater than 2mm
- Single piece optic with +1.50 or +3.00 add
- Bilateral treatment for modified monovision
- Better contrast sensitivity
- Varying levels of glare night vision symptoms