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Essentials for IOL's and IOL Calculations

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Financial Disclosures:

- None

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History:

- 1950 Sir Harold Ridley implanted the first intraocular lens (IOL)
- Routine IOL's were not available until the late 1970's
- Initial Calculations:
  - Add pre-op MRx to a +19.0 lens
    - Ex: -2.00 myope would get a +17.0 power IOL

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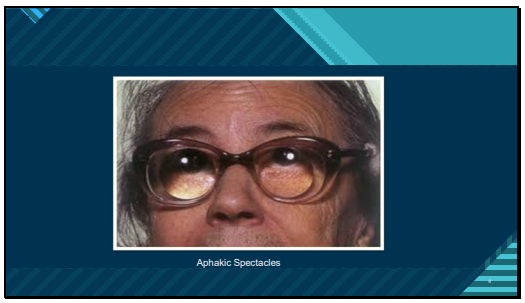

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First Regression Formula

P = A – 2.5L - .9K

- P = power of IOL
- A = A constant
- L = Axial Length
- K = average keratometry

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Question #1

- Which factor is more important in your biometry measurements: Axial length or keratometry?
- Why?

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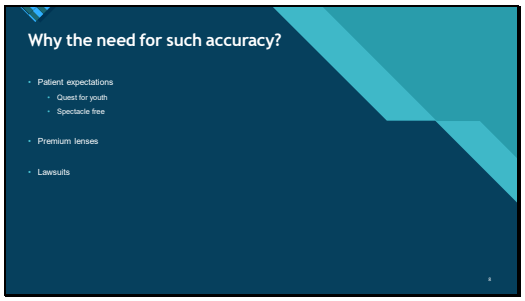

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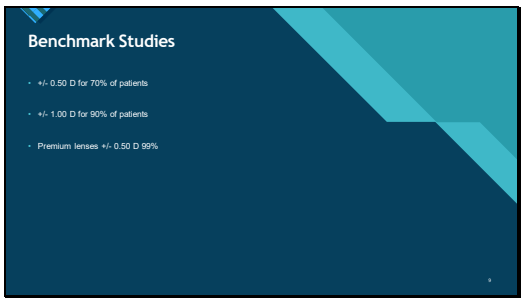

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Types of Biometry

- Contact
- Immersion
- Optical
  - IOL Master
  - Lenstar
  - Pentacam AXL
  - Argos

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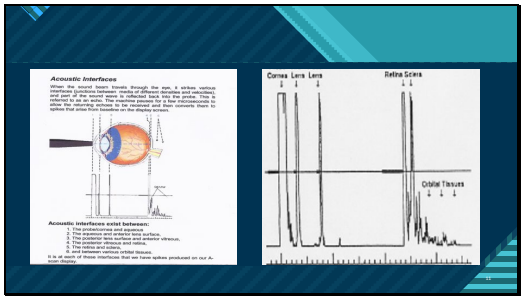

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Contact

- Pros:
  - cheapest
  - Relative ease of use
  - Can be done in sitting or supine
- Oldest and still very common in some areas

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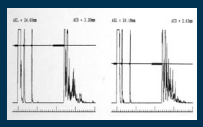
- Cons:
  - Inherently inaccurate due to corneal depression
    - Studies show contact method read anywhere from 0.14 mm to .36 mm too short
- Accuracy at best is 0.1mm



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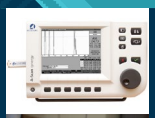
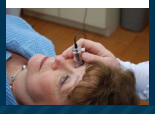
Immersion Biometry

- Involves using a plastic "shell" or cup placed on the eye
- The probes is attached to the shell but NOT touching the cornea
- Accuracy: 0.02 – 0.05mm





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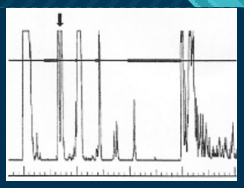

Immersion A-Scan- Note double corneal peaks

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Pros	Cons
• Very accurate • Relatively inexpensive • No corneal depression • Can measure through all densities and types of cataracts	• Slight learning curve • Supine position • Cannot use bleb

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Optical Coherence Interferometry

- IOL Master, Lenstar, Pentacam AXL, Argos
- Measures K's, axial length, ACD, W-W, and lens thickness
- Non-contact
- Extremely accurate: 0.02mm

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Pros	Cons
• Easy to use • Fast • Accurate • Non-contact	• Expense!!! • Doesn't work well with dense or PSC cataracts

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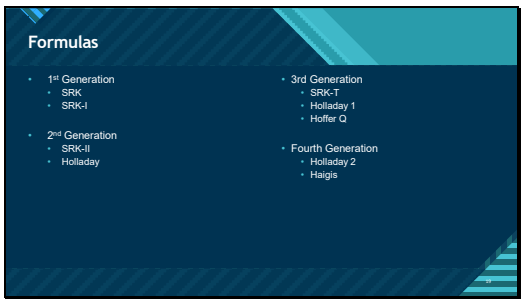

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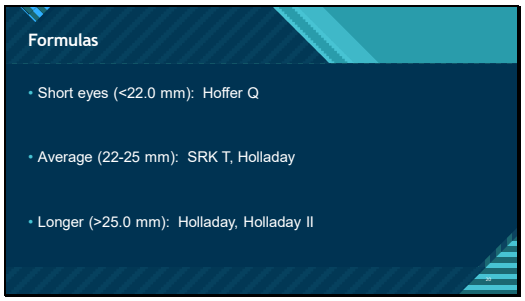

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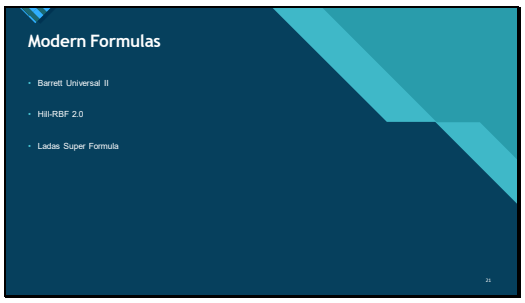

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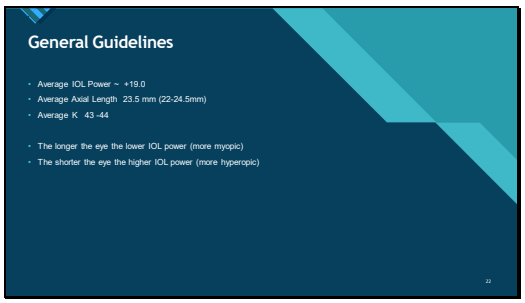

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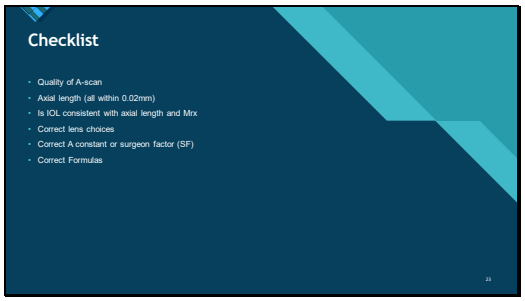

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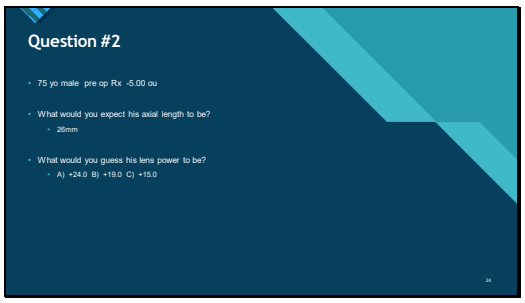

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Complex Calculations

- Toric (astigmatism-correcting)
- Multifocal
- Post-Refractive
  - LASIK/PRK
  - RK
- Keratoconus/Ectasia

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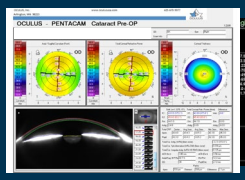
Toric Lens Calculations

- IOL Master
- Pentacam
  - Cataract Pre-op
- Topography
- Online Toric Calculators



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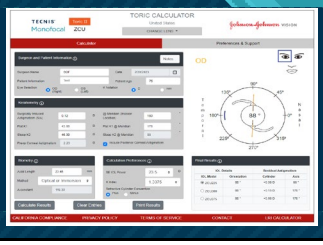
Online Toric Calculator



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Multifocal IOL calculations

- Must hit emmetropia (plano) for these lenses to work

- Cylinder < 1.00

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Multifocal Calculations

- IOL Master
- Pentacam
  - Cataract pre-op
  - Belin-Ambrosio
- Topography
- Angle Kappa

- * OCT macula

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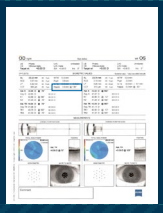

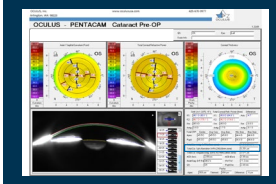

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Post-refractive Calculations

- IOL Master
  - Post-refractive setting
- Pentacam
  - Power Distribution
  - Holladay Report- Equivalent K's
- Topography
- ASCRS Post-refractive calculator
- Historical data

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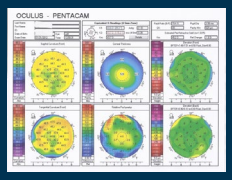

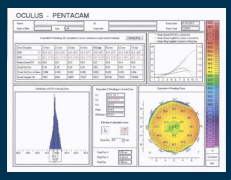

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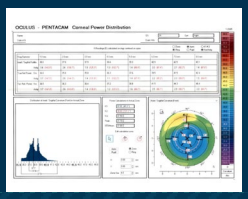

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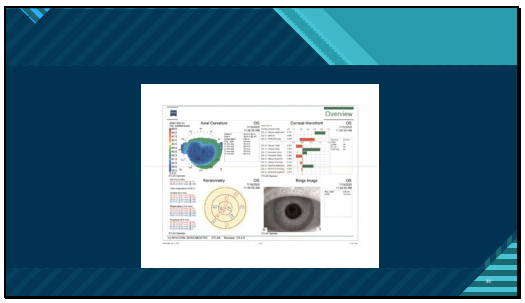

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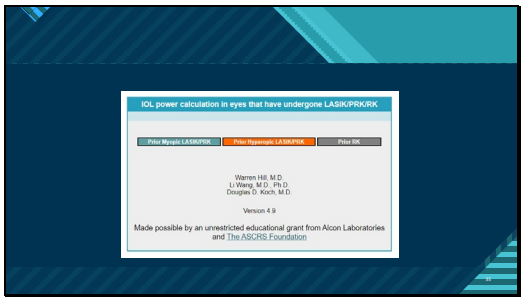

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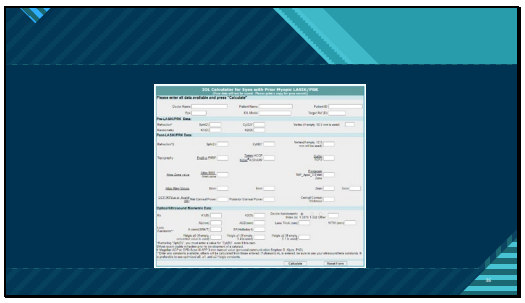

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Classes of IOL's

- Monofocal
- Toric
- Extended Depth of Focus (EDOF)
- Multifocal
- Small aperture
- Light-adjustable (LAL)

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Monofocal IOLs

Pros

- Covered by insurance
- No night-time halos
- No loss of contrast sensitivity

Cons

- Only 1 focal point corrected

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Monofocal IOL's

- J&J
  - Technis (DCBOO)
  - Negative spherical aberration
  - Glistening free
- Alcon
  - Acrysof (SN60WF)
  - Clareon (SY60WF, CNA0T0)
    - Glistening-free
  - Negative spherical aberration
- B&L
  - Akreos (AO60)
  - Envista (MX60)
  - No spherical aberration
  - Glistening free

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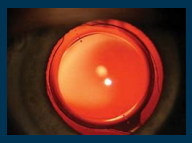
Toric IOLs

- J&J
  - Technis toric II (ZCU)
- Alcon
  - Clareon toric (CNW0T)
- B&L
  - Envista Toric (MX60ET)



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Question #3

- A 65 y/o female presents for cataract evaluation OD.
  - spectacle correction of -2.50 + 2.00 x 92
  - K's: 43.5 x 44.0 @ 94
- Would you offer this patient a toric IOL?

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- No
- Toric lenses only correct corneal astigmatism

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Toric IOL's

Pros	Cons
• Corrects regular corneal astigmatism • Beware of irregular astigmatism • No night-time halos • No loss of contrast sensitivity	• Only corrects one focal point • Out-of-pocket cost

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EDOF IOL's

- J&J
  - Eyhance (DIBOO)
  - Eyhance Toric (DIU)
  - Symfony OptiBlue (DXROOV)
  - Symfony OptiBlue Toric (DXW)
- Alcon
  - Clareon Vivity (CNET0)
  - Clareon Vivity toric (CNWET)
- B&L
  - LuxSmart
  - LuxSmart Toric

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EDOF IOL's

Pros	Cons
• Provides good uncorrected distance and intermediate vision • No night-time halos	• Still need readers • Out-of-pocket cost* • Some loss of contrast sensitivity*

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Multifocal IOL's

- J&J
  - Synergy (DFROOV)
  - Synergy toric (DFW)
- Alcon
  - Clareon Panoptix (CNWTT0)
  - Clareon PanOptix toric (CNWTT)

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Multifocal IOL's

Pros	Cons
• Provides full range of uncorrected vision from distance to near • Spectacle independence	• Out-of-pocket cost • Some loss of contrast sensitivity • Halos/star bursts at night • Need a pristine eye

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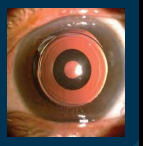
Small-aperture IOL

- B&L IC-8 Apthera
- Uses an opaque ring to create a pinhole effect
- Provides an extended range of vision from distance to near
- Placed in one eye combined with a monofocal or monofocal toric in the fellow eye



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Light-adjustable IOL's

- Allows surgeon to change power of IOL post-operatively
  - Can adjust for spherical and cylindrical power changes
- 3-piece silicone IOL containing UV-absorbing macromers
- Uses UV light to change and lock-in IOL power
- May need 3 to 5 light treatments to achieve vision goals

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Light adjustable IOL's (LAL)

Pros	Cons
• Able to fix post-op refractive surprise or change post-op refractive target	• Expensive equipment • Out-of-pocket cost • Post-op care

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Factors to consider when offering IOL's

- Cost
- Lifestyle
  - Rely on near vision
  - Spectacle independence
  - Night-time driving
- Patient personality
- Astigmatism?
- Any other eye conditions?

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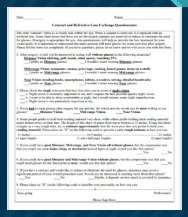
Cataract Questionnaire

Dell Cataract Questionnaire



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Vision Simulators

- TECNIS Vision Simulator

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In conclusion:

- Several different ways to calculate IOL power
  - Key is the get the most accurate data possible with whatever technology accessible
- Wide range of IOL types
  - Key is match IOL with patient's lifestyle and post-op expectations

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