ADVANCED IOL POWER CALCULATIONS

Jack T. Holladay, MD, MSEE, FACS

I. Formulas and Measurements
   A. Variables Used to Predict ACD
      1. Binkhorst 2 - 1981 - AL
      2. Holladay 1 - 1988 - AL, K
      3. SRK/T - 1990 - AL, K
      4. Hoffer Q - 1993 - AL, K
      5. Olsen - 1995 - AL, K, ACD
      6. Clarke- 1996 - AL, K1, K2 ACD, LT
      7. Holladay 2 - 1996 - AL, K, HWTW, REF, ACD, LT, AGE
   B. Normal Values for required Measurements
      1. Axial Length: mean = 23.5 mm, SD = 1.25 mm
      2. Keratometry: mean = 43.81 D, SD = 1.6 D
      3. Horizontal White-to-White (Corneal diameter): mean = 11.7 mm, SD = 0.46 mm
      4. Preoperative Refraction: mean = plano
      5. Anterior Chamber Depth (ultrasonic): mean = 3.1 mm, SD = 0.30 mm
      6. Crystalline Lens Thickness (ultrasonic): mean = 4.7 mm, SD = 0.41 mm
      7. Age: mean = 72, SD = 12 years

II. Axial length Measurements in Aphakic and Pseudophakic eyes
   A. Aphakia - 1532 M/sec
   B. Pseudophakia
      1. PMMA - 2718 M/sec
      2. Silicone - 980 M/sec
      3. Acrylic- 2120 M/sec

III. Determination of corneal power following Keratorefrative Sx (PRK, LASIK, RK)
   A. Manual Keratometry
   B. Automated Keratometry
   C. Corneal Topography
   D. Calculation from pre- keratorefractive surgery K’s
   E. Determination from hard contact lens trial

IV. Data Screening Techniques on Preoperative Measurements
   A. Probability of unusual measurements (one eye only)
   B. Probability of asymmetrical measurements (both eyes)

V. IOL Calculations requiring Axial Length Measurements
   A. Standard Cataract Removal with IOL
      1. Piggy-Back IOL’s: Use 34 D IOL posterior in bag
      2. Multifocal IOL’s: Target distance plano, near for -3.00 D.
      3. Toric IOL’s: IOL Cylinder to Corneal Cylinder ~ 1.46, but not exact for low (1.75) and high (1.20) power IOLs
         a. Optimization of Cataract Incision Location: Normal 4 locations for zero residual astigmatism
         b. Back calculation for surprise: 1) P.O. Refraction &, 2) P.O. Ks OR Current IOL axis
   B. Cataract Removal with IOL and Silicone in Vitreous: use convexplano ~ 3 D more, for biconvex ~ from 5 - 6 D more in IOL.
VI. IOL Calculations not requiring Axial Length
   A. Secondary Implant for Aphakia: in sulcus or anterior chamber angle
   B. AC IOL in phakic patient: High myopia ( - IOL) & High hyperopia ( + IOL)
   C. Secondary Piggy-Back IOL for high hyperopia (or myopia within 1 year)

VII. Pediatric IOL calculations
   A. Ideal Postoperative Target Refraction: plano to -1.00 D.
   B. Expected Myopic Shift with age: 4 D from age 2 to age 21.

VIII. Minimizing Prediction Error
   A. Personalizing Formula Constants (A-const, ACD or Surgeon Factor)
   B. Prediction Error vs. IOL Power
   C. Creating personalized constants for subgroups
      1. Axial Length (< 22 mm or > 26 mm)
      2. Keratometry (< 40 D or > 48 D)
      3. Preoperative Refraction (< -4 D or > +4 D)

IX. Calculating SIRC (Surgically induced refractive change)
   A. From pre and post operative keratometry
   B. From pre and post operative refraction

X. Outcomes Analysis
   A. Prediction Error Analysis: Mean absolute prediction error should be < 0.50 D.
   B. Formula Comparisons: more predictors, better results in unusual eyes
   C. SIRC Results: Astigmatic Analysis
   D. Visual Acuity Results
      1. Best corrected
      2. Uncorrected

XI. Back-calculations
   A. For determining source of error with refractive surprise
   B. Comparison of back-calculated lens constant and actual lens constant
Advanced IOL Power Calculations

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Financial Disclosure

I have the following financial interests or relationships to disclose:
- Abbott Medical Optics: C;
- AcuFocus, Inc.: C,O;
- Alcon Laboratories, Inc.: C;
- ArcScan: C,O;
- Carl Zeiss Inc: C;
- Elenza: C,O;
- Oculus, Inc.: C;
- Visiometrics: C,O;
- Wavetec: C

Vergence Formula

- Theoretical Formula has not changed in 173 years
- Physiologic Assumptions may be slightly different
  - Retinal thickness
  - Corneal Index of Refraction

\[ IOL = \frac{1336}{AL - ELP} - \frac{1336}{1000} + \frac{K}{DPostRx} \]
**Effective Lens Position**

- Distance from corneal vertex to principal plane of thin IOL (no thickness)
- Same as ACD, but avoids confusion with anatomy

**Prediction of ELP**

1. <1980 Constant (0) 4.5
2. 1981 Binkhorst 2 (1) AL
3. 1988 Holladay 1 (2) AL, K
4. 1995 Olsen (4) AL, K, ACD, LT
5. 1996 Holladay 2 (7) AL, K, ACD, LT, HWTW, REF, AGE

**Investigation**

- International Study - 1993
  - 34 investigators (15 U.S.)
  - Additional measurements are taken
    - 35 eyes < 21 mm
    - 35 eyes > 26 mm
    - 35 eyes = normal

**Measurements taken for Predictors of ELP**

1. Axial Length
2. Average K
3. Horizontal WTW
4. ACD
5. LT
6. Pre-op Refraction
7. Age
HWTW Gauge

Horizontal Corneal Diameter.

IOL MASTER 500 – ZEISS
Version 7.70

LENSTAR – HAAG-STREIT

Normal Eyes

Short Eyes ( < 21 mm)

Long Eyes ( > 27 mm)
Normal Physiologic Values

- AL: 23.5 mm ± 1.25 mm
- K: 43.81 D ± 1.6 D
- Hwtw: 11.7 mm ± 0.46 mm
- Ref: -0.60 D ± 2.00 D

Normal Physiologic Values

- ACD: 3.1 mm ± 0.30 mm
- LT: 4.7 mm ± 0.41 mm
- Age: 72 years ± 12.0 years

Critical Data

- Corneal Power
- “Optical” Axial Length
- Horizontal “White-to-White” (11.7)
  - AC angle = WTW + 1.0 (12.7)
  - Sulcus = WTW + 1.5 (13.2)
  - Bag = WTW – 1.0 (10.7)

CONCLUSION

Eye Model must include

NINE types of eyes not only THREE

CONCLUSION: 9 EYES

Anterior Segment Size

<table>
<thead>
<tr>
<th>Axial Length</th>
<th>Large</th>
<th>Normal</th>
<th>Small</th>
</tr>
</thead>
<tbody>
<tr>
<td>Megalocornea + axial hyperopia</td>
<td>(0%)</td>
<td>(80%)</td>
<td>(20%)</td>
</tr>
<tr>
<td>Megalocornea</td>
<td>(2%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Large Eye Buphthalmos</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Megalocornea axial myopia</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Megalocornea</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Micromere</td>
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</tr>
<tr>
<td>Micromere axial myopia</td>
<td></td>
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</tr>
<tr>
<td>Microcornea</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Microcornea</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Relative Importance of Predictors for ELP

1. Axial Length 100
2. Average K 76
3. Horizontal WTW 24
4. Refraction 18
5. ACD 8
6. LT 7
7. Age 1
EMMETROPIC IOL POWER

THE HOLLADAY 2 FORMULA

More Measurements
More Accuracy

RESULTS
New Holladay 2:
- Normal eye: 50% ± 0.40 D
- Unusual eye: 50% ± 0.80 D

Previous results:
- Normal eye: 50% ± 0.50 D
- Unusual eye: 50% ± 5.00 D

FORMULA PERFORMANCE

CONCLUSIONS
- Prediction Errors in Short Eyes: significantly improved by more measurements
- Prediction Errors in Long Eyes: due to bad Axial Lengths, B-Scan

Myopic Staphyloma
**Subtract from Ascan measured Axial Length ~ 0.8 mm**

- **Zaldivar-Holladay JCRS May 2000**
- **Zeiss - IOL Master - 2000**

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**Optimizing intraocular lens power calculations in eyes with axial lengths above 25.0 mm**

Li Wang, MD; Miklo Kovács, MD; Vyas Krishna M. Ma; Thomas Kohnen, MD, PhD; Hery Douglas; O. Koch, MD


**Linear Regression to compensate for AVERAGE Index of Refraction in Long Eyes**

---

**Zeiss-Humphrey IOL Master LenStar**

**Difficult Cases**
- Asteroid Hyalosis (vitreous debris)
- Extreme Length (26.5 mm)
- Uses Average Index Too Long
- Extreme Short (< 21 mm)
- Pseudophakic Eyes
- Silicone in Vitreous

---

**Height & Alpha & Kappa**

If > 0.70 mm then concern!

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Horizontal Angle & Alpha & Kappa

IOL MASTER 500 – ZEISS
Version 7.70

IOL MASTER 500 – ZEISS
Version ≥ 7.10

IOL MASTER 700 – ZEISS
Version ≥ 1.1
Data Screening
Monocular and Binocular

- Using Mean and St. Dev., an exact p-value for each measurement can be calculated.
- Any measurement beyond two Std. Dev. from the mean should be double checked (p<0.05).

Monocular: AL = 19.75 mm
p = 0.001

Binocular: K_right - K_left = 1.5 D
p = 0.0005

Cataract Surgery ...
IOL Power Calculations Following Refractive Surgery

Preoperative Assessment

- Endothelial Cell Count
- Pachymetry
- Direct Ophthalmoscope @ 16"
- Corneal Topography
- Determining Corneal Power
- IOL Calculation
Corneal Power Decision Tree

- No drops, Blink, Blink...
- Keratometry
  - SD > 0.20 D
    - Yes: Dry Eye?
    - No: SD < 0.03 mm
- SD 2.00 D
- SD < 0.03 mm
- No: Treat > 6 wks
- Yes: Ref. Rx, K0, PMD, ...

- H2, Olsen, Barrett Formula
- Exact Toric Calc
  - ATR Adjustment
  - SD > 0.20 D
  - SD < 0.03 mm
  - Toric?
- SD < 0.20 D
- H2, Olsen, Barrett Formula
- Exact Toric Calc
  - Back Surface
  - SD > 0.20 D
  - SD < 0.03 mm

70% of cases

IOL Master
2.5 mm

LenStar
1.7 & 2.3 mm

K = 44 D

Astigmatism Measurement for a 44 D Cornea
- Manual Keratometer
  - 3.2 mm Diameter
- IOL Master® Keratometer
  - 2.5 mm Diameter
- LenStar® Keratometer
  - 2.35 & 1.65 mm Diameters (Average 2.0 mm Diameter)

* Carl Zeiss Meditec AG, Goeschwitzer Str. 51-52, 07745 Jena, Deutschland
† Haag-Streit AG, Gartenstadtstrasse 10, 3098 Koeniz, Switzerland

Ring Diameter affects Keratometry

If SD for K's
> ± 0.20 D (> ± 0.030 mm)

Test for Dry Eye
ToPography/ToMography
Initial Visit 6 wks after Dry Eye Rx

If SD > ± 0.20 D (> ± 0.030 mm)

Not Dry Eye

ToPography/ToMography

Corneal Power after LASIK, PRK, RK

1. Ideally, Calculation from both surfaces
2. Calculation from Prior Data Trial
3. Hard Contact Lens
4. Corneal Topography
5. Automated Keratometry
6. Manual Keratometry
Always Topography/Tomography if Correcting Astig

- To determine if REGULAR and does not change radially
- Tomography can confirm if posterior astig is WTR (~ 0.22D)

Never Perfect Bow Tie

44.8 @ 96 & 40.6 @ 6
ASTIG = +4.2 @ 96
43.5 @ 105 & 41.2 @ 15
ASTIG = +2.3 @ 105

ToMography: Measures Total Power and Total Astigmatism of Lenticle
Topography: Measures Front Surface Power of Lenticle, and then uses back radius of 0.82 of front radius for
Total Power and can ADD 0.22 D ATR for Total Astigmatism.

Keratometry: Measures Front Surface Ring or annulus Power of Lenticle (nominal 2.0 to 3.2 mm for
44 D cornea) then uses back radius of 0.82 of front Radius for Total Power. Should
ADD 0.22 D ATR for Total Astigmatism.

Note: 3.0 mm Mean Zonal Power = 43.00 D
3.2 mm Sim K = 43.75 D
Never use Sim K’s … same as keratometer

4 mm OZ with 6 cuts ~~ - 4.00 D
1. Calculation from Prior Data  
(Pre K & Δ MR known)

Pre KR Mean K = 44.00 D
Change in SEQ Ref = -4.50 D
Calc Mean K = 39.50 D

2. Calculation from Prior Data  
(Post Std. K’s & Δ MR only)

Post Mean K = 40.58 D
Change in SEQ Ref = -4.50 D
STD K’s: -0.24 \times SEQ = -1.08
Calc Mean K = 39.50 D
3. Calculation from Prior Data
(Post Ctr Top Power & Δ MR only)

Post Mean K = 40.27 D
Change in SEQ Ref = -4.50 D
Ctr Top: -0.15 * SEQ = -0.77
Calc Mean K = 39.50 D

4. Trial Hard Contact Lens
(Rigid Contact lens only)

Plano HCL Base Curve = 41.50 D
SEQ Ref without CL = +0.50 D
SEQ Ref with CL = -1.00 D
Front K = 41.50 - 1.50 = 40.00 D
40.00 D – 10% (4.50) = 39.50 D
Mean K = 39.50 D

Post-operative

- Initial Hyperopic Shift
- Long Term Hyperopic Drift
- ATR Astigmatism Drift

If Posterior to Anterior Radius Ratio?
Tomography
Accuracy of EKR

<table>
<thead>
<tr>
<th>Prior</th>
<th>STD 4.5 (D)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sx</td>
<td>0.56</td>
</tr>
<tr>
<td>LASIK</td>
<td>0.94</td>
</tr>
<tr>
<td>RK</td>
<td></td>
</tr>
</tbody>
</table>

New algorithm for intraocular lens power calculations after myopic laser in situ keratomileusis based on rotating Scheimpflug camera data

J Cataract Refract Surg Feb 2015; 41:339–347
Asymmetric Bowtie

Early Keratoconus

Post LASIK

Normal       LASIK         RK

41 to 44 D

3 D Range

36 to 41 D

5 D Range

32 to 45 D

13 D Range

Summary

- Optimal Zone
  - LASIK: 4.5 mm
  - RK: 5.0 mm
  - Customize for small/large pupils

- Accuracy
  - LASIK: ± 0.56 D
  - RK: ± 0.94 D

- Error on MYOPIC side

IOL CALCS in Keratoconus

- Corneal is Bifocal
- Patient does not look through cone for distance (may use at 10 cm as magnifier)
- Look at Power Distribution
- Use Paracentral Power (65% Mean Power)
Keratoconus #1

Keratoconus Calculation #1

**OS**
- Used Km = 46.5 D => +1.00 D
- Should have used 65% Mean
  - 45.5 D => plano
  - should have targeted -0.50 D
    (-0.50 always better than +0.50)

IOL Calcs Using Axial Length
- Cataract or Clear Lens’ Removal
- Primary Piggy-Back IOL’s
- Multifocal IOL’s
- Toric IOL’s
- Silicone in Vitreous Compartment

Axial Length Measurements
- Phakia
- Aphakia
- Pseudophakia
- PMMA
  - AL\textsubscript{1532} + 0.4
- Silicone
  - AL\textsubscript{1532} - 0.6
- Acrylic
  - AL\textsubscript{1532} + 0.2
Primary Piggy-Back IOL's

- Current Formulas are very inaccurate
- ELP underestimated due to AL
- Back lens displaced posteriorly
- Severe hyperopic errors (+5 D)

Polypseudophakia

Up to 4 IOL's

PIGGY-BACK INTRAOCULAR LENSES

J.T. Holladay  James P. Gills
Jane Leidlein  Myra Cherchio

“Achieving Emmetropia In Extremely Short Eyes With Two Piggy-Back Posterior Chamber Intraocular Lenses.”
July 1996  Blue Journal"
Primary Piggy-Back Complications

Acrylic
- Interlenticular membrane
- 3 to 5 D hyperopic shift @ 3 yr

Silicone
- Interlenticular membrane
- Flat Spot

Minimizing Prediction Error
- Holladay 2 Formula
- Personalize Constant
- Prediction Error vs. IOL power
- Constants for Sub-groups
  - Axial Length, K's and Refraction

Toric IOL’s
- Current Formulas do not work because calculate different ELP for steep and flat meridian
- Predicted ELP must be the same for each meridian – only one IOL position

Toric IOL’s
- Calculate IOL power for steep and flat meridian using same ELP
- Difference in IOL powers is the toricity necessary to completely correct corneal astigmatism

Ideal Toric IOL Calcs
- Accurate corneal power and astigmatism ... repeat is SD > 0.020 D (0.030 mm)
- Exact Toric Calculator (not a constant ratio of corneal astigmatism to toricity (1.46)
- Proper Surgically Induced Astigmatism (SIA) for incision location and magnitude and axis of PreOp astigmatism ... must account for ATR over 3 to 6 months PostOp
- Results will be greater than 80% within 0.50 D

Toric IOL’s
- Always choose toricity to undercorrect corneal astigmatism – WRONG!
- LEAVE MIN RESIDUAL CYL!
- Eg: Steep calc yields 24.0 D
  Flat calc yields 27.0 D
- Ideal Toricity is 3.0 D
  (Use 24.0 D with < 3.0 D of toricity)
Never Perfect Bow Tie
44.8 @ 96 & 40.6 @ 6
ASTIG = +4.2 @ 96
43.5 @ 105 & 41.2 @ 15
ASTIG = +2.3 @ 105

Toric IOL Calculations
- Commercial Calculators use a constant ratio (1.46) for the corneal cylinder to the IOL cylinder
- Exact Calculation depends on IOL SEQ Power and ELP … to correct 2D of corneal astigmatism
  - 10 D IOL => 3.5 D Cylinder
  - 22 D IOL => 2.9 D Cylinder
  - 34 D IOL => 2.4 D Cylinder
A 1.1 D difference from 10 D to 34 D!

Toric Calculators
Exact
- Holladay On-line
- AMO Express On-line
- Holladay IOL Consult
Approximate
- Alcon On-line
- B & L On-line
- Barrett On-line

Dioptic Error vs. Angular Error for a 1.00 D of astigmatism

<table>
<thead>
<tr>
<th>Angle Error (°)</th>
<th>Dioptic Error (D)</th>
<th>% Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>0°</td>
<td>0.00</td>
<td>0%</td>
</tr>
<tr>
<td>15°</td>
<td>0.52</td>
<td>52%</td>
</tr>
<tr>
<td>30°</td>
<td>1.00</td>
<td>100%</td>
</tr>
<tr>
<td>45°</td>
<td>1.41</td>
<td>141%</td>
</tr>
<tr>
<td>60°</td>
<td>1.73</td>
<td>173%</td>
</tr>
<tr>
<td>75°</td>
<td>1.93</td>
<td>193%</td>
</tr>
<tr>
<td>90°</td>
<td>2.00</td>
<td>200%</td>
</tr>
</tbody>
</table>

Dioptic Error = 2 * Cyl * sin (angular error)


Surgically Induced Astig (SIA)
- Critical to use correct value
- Not ~0.35 D WTR for small (2.5 mm), near-clear temporal incision
- Better to use Zero SIA and Baylor Nomogram
  - ↓ WTR (steep 90) by ONE Toric Size (T4 ➞ T3)
  - ↑ ATR (steep 180) by ONE Toric Size (T3 ➞ T4)
  - No change in Oblique
- Equivalent to ADDING ~ 0.51 D ATR as SIA

Wang/Koch Recommendation
- WTR: Subtract 0.6 D from measured
- ATR: Add 0.2 D to measured
- Oblique: No change
Equivalent to:
SIA = 0.2 + 0.4 \( \sin^2 (\text{Steep axis of astigmatism}) \)
\( 0 = 0.2@90 \quad 45 = 0.4@90 \quad 90 = 0.6@90 \)

Additional Factors (Wang/Koch)
- Posterior cornea has ~ 0.25 D WTR
- WTR decays ~ 0.50 D WTR
- ATR decays ~ 0.00 D ATR
- Result: ↓ \( K \) WTR by 0.75 D
  ↑ \( K \) ATR by 0.25 D
**Post Op Toric Calculators**

- Holladay IOL Consultant
  - [www.hicsoap.com](http://www.hicsoap.com)
- Berdahl & Hardten Toric IOL Calculator
  - [www.astigmatismfix.com](http://www.astigmatismfix.com)

**Two Sources of Error**

- IOL misaligned (wrong axis)
- IOL Toricity wrong (over/under)

  Or

- Both
Silicone in Vitreous Cavity

- Use Convexo-Plano IOL to minimize effect of Silicone (add 3 D to calculated IOL)
- If Biconvex IOL (add 6 D to calculated IOL)
- When Silicone removed -- 2 to 5 D of induced myopia
IOL Calculation without AL

- Secondary AC or PC IOL for Aphakia
- Secondary Piggy-Back AC or PC IOL for Pseudophakia
- Primary AC IOL in Phakia

REFRACTION FORMULA

\[
IOL = \frac{1336}{1000} \left( \frac{1336 - ELP}{1000} + K \right) - \frac{1336}{1000} \left( \frac{1336 - ELP}{1000} + K \right)
\]

Secondary Piggy-Back IOL’s Indications

Intolerable Pseudophakic Refractive Error

Refractive Surprises

- Previous RK, PRK, LASIK
- Bad axial length - short/long
- Mislabeled IOL
- Axially displaced
- Misc.

Secondary Piggy-Back Calc
Advantages over Exchange

- Mislabeled IOL irrelevant
- Less risk to capsule or zonules
- Mismeasured AL irrelevant
- No AP shift of existing IOL
- Fewer unknown variables
Phakic IOL’s

- Compete with corneal refractive procedures for high myopia and med & high hyperopia
- ACL, ICL or Iris Clip?

Phakic IOL’s

(Secondary Piggy Back IOL’s)

Refraction Formula
Phakic IOL Calculation
Input Variables

- Refraction and Vertex
- Keratometry
- Desired Refraction
- Predict ELP (ACD)

Effective Lens Position

REFRACTION FORMULA

\[
\text{IOL} = \frac{1336}{1000} \left( V \right) \left( \frac{K - \text{PreRx}}{1336 + \text{ELP}} \right)
\]


Phakic IOL Calculation

Input Variables

- Refraction and Vertex
- Soft Contact Lens @ Vtx = 0
- Small Over-Refraction (< ± 2 D) is most accurate.

Effective Lens Position (ELP)

OLD ACD

- Verisyte Avg ELP = 4.27 mm
- AACC (20 y/o) = 3.60 mm

\[\text{AACC} + 0.67 \text{ mm} = \text{ELP} \]

Effective Lens Position (ELP)

OLD ACD

- Visian ICL Avg ELP = 4.00 mm
- AACC (20 y/o) = 3.60 mm

\[\text{AACC} + 0.40 \text{ mm} = \text{ELP} \]

Effective Lens Position (ELP)

OLD ACD

- Visian ICL Avg ELP = 4.00 mm
- AACC (20 y/o) = 3.60 mm

\[\text{AACC} + 0.40 \text{ mm} = \text{ELP} \]

Table of Recommended Visian ICL Overall Diameter by White to White and ACD Measurements

<table>
<thead>
<tr>
<th>White to White (mm)</th>
<th>ACD (mm)</th>
<th>Recommended IOL Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;10.5</td>
<td>All</td>
<td>Not Recommended</td>
</tr>
<tr>
<td>10.5-10.6</td>
<td>&gt;3.5</td>
<td>12.1</td>
</tr>
<tr>
<td>10.7-11.0</td>
<td>All</td>
<td>12.1</td>
</tr>
<tr>
<td>11.1</td>
<td>&gt;3.5</td>
<td>12.1</td>
</tr>
<tr>
<td>11.2-11.4</td>
<td>All</td>
<td>12.6</td>
</tr>
<tr>
<td>11.5-11.6</td>
<td>&gt;3.5</td>
<td>12.6</td>
</tr>
<tr>
<td>11.7-12.1</td>
<td>All</td>
<td>13.2</td>
</tr>
<tr>
<td>12.2</td>
<td>&gt;3.5</td>
<td>13.2</td>
</tr>
<tr>
<td>12.3-12.9</td>
<td>&gt;13</td>
<td>All</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Not Recommended</td>
</tr>
</tbody>
</table>
Phakic IOL Calculations

- + IOL’s to Specs ~ 1.5 to 1
- - IOL’s to Specs ~ 1.0 to 1
- Approximation only

Thank you!

Sydney April 23, 2002

The International Society of Refractive Surgery

Please Evaluate Our Course

There are two ways to get to the course evaluation:

1. Make sure you got scanned coming into the room – you will receive a daily digest tonight with links to all of the evaluations for courses and sessions you were scanned entering, or
2. Go to the Mobile Meeting Guide (www.aao.org/mobile), where handouts are also located, and click on the "Evaluate" button.

Attendee participation in the evaluation process is critical for maintaining the quality of the program and we appreciate your feedback!