Improvement Strategies: Biometry, Topography, Power Cals to Ref Surprises

Jack T. Holladay, MD, MSEE, FACS
Clinical Professor of Ophthalmology
Baylor College of Medicine
Houston, Tx

Requirements

- Accurate Biometry – Optical (IOL Master or LenStar)
- Accurate K’s- Repeatable
- 4th Generation Formula (WTW)
- Personalized Lens Constant
- Eliminate Corneal Astigmatism

Subtract from Ascan measured Axial Length ~ 0.8 mm

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

The Promise of No Glasses or Contact Lenses!
Linear Regression to compensate for AVERAGE Index of Refraction in Long Eyes

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IOL Power Calculations
- Pentacam can measure FRONT & BACK SURFACE POWER
- Can Calculate:
  - Equivalent K-Reading (EKR)
    - 65% Mean, Peak & Average
  - NET POWER

EKR
- Reports Keratometry value but adjusts for Back Surface Power from Normal (Current IOL Formulas)
- If corneal front surface is 7.5 mm (45 D), but if back surface -0.3 D > normal:
  \[ EKR = 45.0 - 0.3 = 44.7 \text{ D} \]
  Note: Net Power = 43.3 D
IOL Calcs – Abnormal Cornea

(Use 65% MEAN EKR)

- Post Refractive Surgery
- Post PKP
- Keratoconus
- Corneal Scar
- Any Irregular Astigmatism

Use 65% Mean EKR
(@ 4.5, 4 & 3 mm zones)

Normal       LASIK         RK

41 to 44 D 3 D Range
36 to 41 D 5 D Range
32 to 45 D 13 D Range

POST LASIK

Post LASIK CALC

- $K_{\text{mean}} = 39.8 \text{ D}$
- Used 39.8 D => SEQ = +1.12 D
  (+1.00 + 0.25 X 155 = 20/20)
- 65% mean = 38.8 D => +0.12 D
- Use 65% mean $K$

Conclusions

- EKR – Use 65% Mean for all IOL Calcs
- Look @ smaller zones than 4.5 mm if pupil very small
  (< 3.0 mm in dim light)
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Vergence Formula

\[
IOL = \frac{1336}{AL - ELP} - \frac{1336}{1000} + K(\text{Post } R) \]

CONCLUSION: 9 EYES

<table>
<thead>
<tr>
<th>Anterior Segment Size</th>
<th>Megalocornea</th>
<th>Megalocornea</th>
<th>Large Eye</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>+ axial hyperopia (0%)</td>
<td>axial myopia (10%)</td>
<td>Buphthalmos</td>
</tr>
<tr>
<td>Normal</td>
<td>normal</td>
<td>normal</td>
<td>Megalocornea</td>
</tr>
<tr>
<td>Small</td>
<td>Small eye</td>
<td>Microcornea</td>
<td>Microcornea</td>
</tr>
<tr>
<td></td>
<td>Nanophthalmia (20%)</td>
<td>+ axial myopia (0%)</td>
<td>+ axial myopia (2%)</td>
</tr>
<tr>
<td>Short</td>
<td>Normal</td>
<td>Normal</td>
<td>Normal</td>
</tr>
<tr>
<td>Normal Axial Length</td>
<td>Long</td>
<td>Long</td>
<td>Long</td>
</tr>
</tbody>
</table>

Measurements taken for Predictors of ELP

- Axial Length
- Average K (Pre Ref)
- Horizontal WTW
- ACD
- LT
- Pre-op Refraction
- Age

FORMULA PERFORMANCE

\[
\text{Mean Absolute Error (D)}
\]

N = 997
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Personalized Lens Constant

- Never use Manufacturer’s Constant except to start
- 20 to 40 cases and continue
- Factors
  - IOL Style
  - Lens placement
  - Post op medications
  - Biometer, keratometer, ...

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 Optimization
Thank You!