MERLE FERNANDES
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ISSUES

Myopic Shift

IOL Power Formula

Amount of shift & Age

AL/K Measurement

Target Refraction
NORMAL EYE GROWTH

• Birth
  - Mean AL = 16.6 – 17.0 mm
  - Mean K = 51.2D

• Rapid Growth: 1st 3 months, AL = 18.23 mm

• Slow Growth: till 15 yrs, AL = 23.6 mm

• K : 51.2D → 43.5D

• Lens power : 1st yr, ↓ 10D
  2nd – 10th yr, ↓ 3-4D
FACTORS AFFECTING AXIAL LENGTH

- Normal eye growth
- Age at surgery
- Genetics
- Laterality
- IOL (+/-)
- Visual input
<table>
<thead>
<tr>
<th>AGE</th>
<th>Plager et al</th>
<th>Crouch et al</th>
<th>Wilson et al</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 1 yr</td>
<td></td>
<td></td>
<td>6.22D</td>
</tr>
<tr>
<td>2-3 yrs</td>
<td>4.6D</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3-4 yrs</td>
<td></td>
<td>3.66D</td>
<td></td>
</tr>
<tr>
<td>6-7 yrs</td>
<td>2.68D</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7-8 yrs</td>
<td></td>
<td>2.03D</td>
<td></td>
</tr>
<tr>
<td>8-9 yrs</td>
<td>1.25D</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9-10 yrs</td>
<td></td>
<td>1.88D</td>
<td></td>
</tr>
<tr>
<td>11-14 yrs</td>
<td>0.61D</td>
<td>0.97D</td>
<td></td>
</tr>
<tr>
<td>15-18 yrs</td>
<td></td>
<td>0.38D</td>
<td></td>
</tr>
</tbody>
</table>

Plager DA et al. JCRS 2002  
Crouch ER et al. JAAPPOS 2002  
Wilson ME et al. JAAPOS 2001
TARGET POST OP REFRACTION

Rule of 7

Age + Target Hyperopia = 7

2 yrs + 5D = 7

Enyedi LB et al. AJO 1978
Older Children

- 2 - 4 yrs

IOL power = Sph equiv (fellow eye) -1.25D

- > 4 yrs

IOL power = Sph equiv (fellow eye)
TARGET POST OP REFRACTION

Infants

• Adult IOL power
• Correct hyperopia with glass/CL
• Incorporate near add

Burke JP et al. BJO 1989
Hiles DA et al. Ophthalmology 1984
Infants

• Emmetropia
• Easier amblyopia Rx
• Myopic shift – CL/refractive surgery

Masket S et al. JCRS 1991
TARGET POST OP REFRACTION

Infants

• < 6m : Moderate hyperopia (≥ 3D to 7D)
• 12 m : Mild hyperopia (>0 to < 3D)

Wilson ME et al. JCRS 2003
Infants

• Infant Aphakia Treatment Study

• 4 - 6 wks : 8D

• 6 wks – 6m : 6D
MEASUREMENT OF AL & K

Issues

• Difficult in office setting
• EUA may be needed
• Errors in measurement
Keratometry

• Lack of fixation under anesthesia → inaccurate K

Mittelviefhaus H et al. Ophthalmologe 2000
MEASUREMENT OF AL & K

Axial Length Measurement

- **Applanation**
  - Indentation of cornea

- **Immersion**
  - Not perpendicular to retina

- Immersion scan recommended

*Trivedi RH et al. JCRS 2011*
**Axial Length Measurement**

- Depends on US velocity setting
- AL of 25 mm best measured with 1550m/sec
- AL of 20 mm best measured with 1560m/sec
- Accurate measurement by setting average velocity of 1532m/sec and correcting for AL
- Corrected AL Factor (CALF) 0.32 added to AL

Hoffer KJ. JCRS 1994
MEASUREMENT OF AL & K

Axial Length with Partial Coherence Interferometry

- Reliable & accurate in children
- Highly reproducible, non-contact, observer independent
- Laser doppler measures echo delay & intensity of infrared light

Hussin HM. Eye 2005
IOL POWER CALCULATION

Issues

• IOL power formulae derived from adult data
• Predictability uncertain
• Conflicting reports in literature

• Unpredictable outcome with Hoffer Q, Holladay, SRK, SRK II and SRK T

Mezer E et al. JCRS 2004
IOL POWER CALCULATION

Issues

• Unpredictable outcome with Hoffer Q, Holladay, SRK, SRK II and SRK T

Mezer E et al. JCRS 2004

• Little difference between above formulae

<table>
<thead>
<tr>
<th>Axial length</th>
<th>Mean Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long eyes</td>
<td>1.23 – 1.33 D</td>
</tr>
<tr>
<td>Medium eyes</td>
<td>0.98 – 1.03 D</td>
</tr>
<tr>
<td>Short eyes</td>
<td>1.41 – 1.8 D</td>
</tr>
</tbody>
</table>

**IOL POWER CALCULATION**

**Issues**

- No significant difference between SRK, SRK II, SRK T & Holladay I

- > variability if < 2 yrs

*Neely DE et al. JAAPOS 2005*
IOL TYPES

• PMMA: inflammation, PCO formation
• Square edge IOL comparable to acrylic

Brar GS et al. CEO 2008
Rowe NA et al. BJO 2001

• Hydrophobic acrylic single piece: in-the-bag
• Safe to use

Wilson ME et al. JAAPPOS 2001
Trivedi RH et al. JCRS 2003

• Hydrophobic acrylic 3 piece: in-the-sulcus
CONCLUSION

- Target hyperopia to avoid myopic shift
- Increasing trend to IOL implantation in infants
- Careful measurements to avoid errors in AL & K
- IOL power calculation formulae derived for adults
- More studies needed to determine best formula
• Mezer E et al. Early postoperative refractive outcomes of pediatric intraocular lens implantation. JCRS 2004; 30: 603-610
**SUGGESTED READING**

- Astle W et al. Surgical outcomes of primary foldable intraocular lens implantation in children. JCRS 200: 1216-1222
Thank you!

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www.lvpei.org

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