Toric IOL Selection and Positioning Guided by Intraoperative Aberrometry

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• Abbott Medical Optics Inc. –L
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• IOP Ophthalmics – C,L

Intraoperative Aberrometry

• “Real-time” aphakic readings
• Assist with IOL choice
  – Power calculation
  – Toric calculation
• Astigmatism management with Toric IOLs alignment and LRIs

Toric IOL

• Intraocular lens designed to decrease postoperative astigmatism
• Multiple manufacturers
  – Alcon
  – Abbott Medical Optics
  – Staar
  – Bausch & Lomb
Intraoperative Aberrometry

• Value?

• To our knowledge, there is no peer-reviewed literature evaluating the use of aberrometry with Toric IOLs

Methods

• Non-randomized retrospective comparative trial

• Private practice setting

• 2 surgeons

Baseline Characteristics of Intraoperative Aberrometry vs Toric Calculator Groups

• Aberrometry group (n= 37 eyes)
  – Cylinder power and axis of placement determined by ORA aphakic refraction
    • Placement refined by pseudophakic refraction

• Toric calculator (“traditional method”) group (n=27 eyes)
  – Cylinder power and axis of placement determined by standard biometry and toric calculator

• Primary Outcome Measurement
  – Post-op refractive cylinder

Methods

• Aberrometry group: 37 cases
  • Mean pre-op keratometric astigmatism:
    - 1.83 D ± 0.79 D
    - Range 0.74 D to 3.77 D
  • Mean postop timeframe:
    - 58 days (2 months)
    - Range: 15 to 132 days
  • Lenses implanted
    - SN6AT3: 18
    - SN6AT4: 4
    - SN6AT5: 5
    - SN6AT6: 2
    - SN6AT7: 1
    - SN6AT8: 2
    - ZCT150: 3
    - ZCT225: 1
    - ZCT300: 1

• Non-ORA group: 27 cases
  • Mean pre-op keratometric astigmatism:
    - 1.59 D ± 0.69 D
    - Range 0.69 D to 4.10 D
  • Mean postop timeframe:
    - 60 days (2 months)
    - Range: 29 to 119 days
  • Lenses implanted
    - SN6AT3: 18
    - SN6AT4: 2
    - SN6AT5: 6
    - SN6AT7: 1
Preoperative Keratometric Astigmatism Versus Aphakic Aberrometry Measurement (n=37)

Altered Decision Making in OR; Aberrometry Group

- Toric IOL power
  - Changed 24% of the time (9/37)

- Spherical IOL power
  - Changed 35% of the time (13/37)

Preoperative Keratometric Astigmatism Toric Calculator Group (n=27)

Number of Rotations Made After 1st Toric Lens Positioning Pseudophakic Measurement

No rotations were necessary in 2/3rd of aberrometry cases
No Rotations Necessary in 2/3 cases

- No rotations; 68%
  - This number may also be aided by intraop info provided to surgeon via reticle and apheric refraction/vector analysis
- ≤ 3 rotations; 92%
- > 3 rotations; 8%

Post-Operative Residual Refractive Astigmatism (RRA)

<table>
<thead>
<tr>
<th>Percentage (Patients)</th>
<th>≤ 0.25 D RRA</th>
<th>≤ 0.50 D RRA</th>
<th>≤ 0.75 D RRA</th>
<th>≤ 1.00 D RRA</th>
</tr>
</thead>
</table>
| % patients  
Aberrometry group  
n=37  
mean: 0.46 D ± 0.42 | 38% | 78% | 86% | 95% |
| % patients  
Non-Aberrometry  
group  
n=27  
mean: 0.68 D ± 0.34 | % | % | % | % |
| Results of Alcon  
FDA Trial  
n=244  
mean: 0.55 D ± 0.50 D | -- | 62% | -- | 88% |

Non Aberrometry Group

Pre-op and Post-op Astigmatism

- 57% reduction in cylinder

Chance of a patient being in a lower postoperative residual refractive range increases when intraoperative aberrometry is used

p-value: .0130

Postoperative Residual Refractive Astigmatism

<table>
<thead>
<tr>
<th>Mean</th>
<th>Standard Deviation</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non ORA</td>
<td>0.68 D +/- 0.34 D</td>
<td>.0153 statistically significant</td>
</tr>
<tr>
<td>ORA</td>
<td>0.46 D +/- 0.42 D</td>
<td></td>
</tr>
</tbody>
</table>

Mean 0.55 D ± 0.50 D

57% reduction in cylinder
**Aberrometry Group**

**Pre-op and Post-op Astigmatism**

- Preop Keratometric Cylinder
- Postoperative Refractive Cylinder
- 75% reduction in cylinder (p-value: .0027)

**UCDVA Results**

*Eyes targeted for distance only, no ocular disease*

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non ORA logmar equivalent</td>
<td>0.16</td>
<td>+/- 0.14</td>
<td>-0.12</td>
<td>0.40</td>
</tr>
<tr>
<td>ORA logmar equivalent</td>
<td>0.11</td>
<td>+/- 0.17</td>
<td>-0.12</td>
<td>0.70</td>
</tr>
</tbody>
</table>

**Review of an Aberrometry Case in which ORA was not followed**

- Female, 61 years old
  - IOLMaster k’s: 2.48 @ 177
  - Autorefraction k’s: 1.50 @ 87
  - Other device k’s: 1.12 @ 171
  - Target refraction: plano
- Preop plan to implant 13.5 D SN6AT3
Review of an Aberrometry Case in which ORA was not followed

ORA showed T3 with > 1 D residual astigmatism during 1st apheric measurement

Limitations

- Cost
- OR time
- Learning Curve
- IOP
- Bubbles
- Lid speculum

Patient’s manifest refraction at 15 days postop was -2.00 +2.00 x 174
Conclusions

• You don’t always “get it right the first time”...
  – Toric power changed in 25%
  – > 1 rotational adjustment in 1/3

• Intraop aberrometry reduces absolute post-operative RRA and improves UCVA

• Aberrometry (in our hands) 2.5 x more likely to achieve ≤0.50 D residual refractive astigmatism