Dr. Charles Henry

Corneal Hysteresis in Post-Radial Keratotomy Primary Open Angle Glaucoma
Joshua Hardin, MD
UAMS Jones Eye Institute
Table Rock Regional Roundup
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Disclosures

• No disclosures
Corneal Hysteresis and the Ocular Response Analyzer (ORA)

- The Ocular Response Analyzer (ORA, Reichert Technologies, Depew, NY) is a dynamic pneumotonometer which measures corneal hysteresis (CH) – a biomechanical property described as corneal viscosity.
- https://youtu.be/0Bo1iWgWQes

ORA Printout

- IOPcc – cornea-correlated pressure
- IOPg – goldmann-correlated pressure
- CH – corneal hysteresis
- CRF – corneal resistance factor

Factors of Influence

- Axial length
- Refractive error
- Corneal Thickness
- Diabetes
- Age
- Race
- Refractive Surgery
Background

- Low corneal hysteresis has been shown to be associated with optic nerve and visual field damage and risk for progression in primary open angle glaucoma (POAG).

- No studies have thus far examined the effect of radial keratotomy on corneal hysteresis in POAG.


Purpose

- To determine whether there is a difference in corneal hysteresis between POAG patients with RK and myopic, non-RK POAG patients and whether this difference could affect pressure measurement between the groups.

Methods

- Two groups of glaucoma patients of the Little Rock Eye Clinic, Little Rock, AR were prospectively recruited.
  - POAG with prior RK
  - POAG with myopia (> -3.00)

Inclusion Criteria
  - Primary Open Angle Glaucoma
  - At least 3D of myopia (SE, prior to RK / cataract surgery)

Exclusion Criteria
  - Other types of glaucoma
  - Ocular Hypertension
  - Glaucoma Suspect
  - Pathologic narrow angles
  - Corneal Transplant
  - Corneal scar / scarring / opacity
  - Rigid contact lens use (within 1 year)
  - Recent surgery to eye (within 1 month)
  - Other refractive surgery: e.g. Lasik/PRK
Methods

- Historical survey, slit lamp examination of incisions / optical size, Goldmann Applanation IOP, Corneal Topography for central 4 mm zone K, IOL Master for Axial Length, and ORA testing (4 successive trials per eye) were performed.

Demographics

<table>
<thead>
<tr>
<th>Variable</th>
<th>POAG with Myopia (Mean) ± SD</th>
<th>POAG with RK (Mean) ± SD</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>52</td>
<td>28</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>63.4 (10.3)</td>
<td>64.2 (6.6)</td>
<td>0.6758</td>
</tr>
<tr>
<td>Caucasian</td>
<td>96.5%</td>
<td>95.4%</td>
<td>0.2496</td>
</tr>
<tr>
<td>Female</td>
<td>48.1%</td>
<td>49.4%</td>
<td>&gt; 0.99</td>
</tr>
<tr>
<td>Family Hx</td>
<td>50.0%</td>
<td>47.0%</td>
<td>0.7073</td>
</tr>
<tr>
<td>Diabetes</td>
<td>33.3%</td>
<td>16.7%</td>
<td>0.4061</td>
</tr>
<tr>
<td>Years Since Dx</td>
<td>13.8 (9.7)</td>
<td>12.8 (8.6)</td>
<td>0.6235</td>
</tr>
<tr>
<td>Steroid Use</td>
<td>17.3%</td>
<td>10.7%</td>
<td>0.5261</td>
</tr>
</tbody>
</table>

Results
Results

- When AL and CCT were factored in, RK status on CH was significant ($p < 0.001$) with an estimated difference of $1.16$ mmHg.
- Diabetes was added and the effect of RK status remained significant ($p < 0.001$) with an estimated difference of $1.01$ mmHg.
- Significant differences were detected in the gcIOP ($1.89$ mmHg, $p = 0.00854$) and ccIOP ($2.62$ mmHg, $p=0.000308$) between the two groups when GA, CCT, AL were factored in.

Limitations

- Limitations of our study include: lack of other control groups, non-matched participants (secondary to difficulty in obtaining pre-RK records)

Conclusions

- CH is lower by $\sim 1.01$ mmHg in patients with RK and POAG compared to myopic POAG patients.
- gcIOP is higher by $\sim 1.89$ mmHg and ccIOP is higher by $\sim 2.62$ mmHg in patients with RK and POAG compared to myopic POAG patients.
- This study suggests that ORA data of patients with RK should be interpreted differently and this may affect the diagnosis and management of POAG.
Clinical Application

<table>
<thead>
<tr>
<th></th>
<th>Radial Keratotomy and Glaucoma</th>
<th>Myopia and Glaucoma</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goldmann Applanation</td>
<td>16.12 mmHg</td>
<td>16.49 mmHg</td>
</tr>
<tr>
<td>Corneal Hysteresis</td>
<td>8.97 mmHg</td>
<td>10.13 mmHg</td>
</tr>
<tr>
<td>Goldmann-Correlated IOP</td>
<td>17.06 mmHg</td>
<td>15.17 mmHg</td>
</tr>
<tr>
<td>Cornea-Correlated IOP</td>
<td>18.61 mmHg</td>
<td>15.99 mmHg</td>
</tr>
</tbody>
</table>

Wrap-Up

• CH plays a major role in glaucoma – similar to that of central corneal thickness.
• In RK patients corneal hysteresis is reduced and cclOP is significantly higher.

Support / Contributors

- Coauthors: Lydia Lane, Grant Morshedi, Christian Hester, J. Charles Henry
- Little Rock Eye Clinic: Shauna Pritchett, Stevi Riddle, Megan Vandament
- University of Arkansas Medical Sciences, Translational Research Institute: C. Michael Bailey, Horace J. Spencer, III
- Jones Eye Institute
Questions?