Guidelines for fitting of RGP in keratoconus

By
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keratoconus

• The normal human cornea generally has a Prolate configuration: steepness in the center and progressive flattens toward the periphery.
• When disease alters the corneal shape, fitting these corneas becomes a challenge.
keratoconus

- When a keratoconic patient is no longer able to obtain good visual acuity as a result of increasing levels of irregular astigmatism and higher-order aberrations, rigid contact lenses will be required, effectively to provide a new anterior surface to the eye.

Types of contact lens

1) Scleral lenses
2) Corneal lenses
   - *Traditional PMMA lenses*
   - *Soft lenses*
   - *Rigid Gas Permeable lenses (RGP) lenses*
   - *Combination of rigid and soft material*
   - *Piggy back contact lens*
**RGP contact lens**

First choice for correcting the irregular astigmatic corneas

**Aim:**
- Modify the irregular conical surface of the cornea
- Try to distribute the touch of the lens

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**Different Designs of RGP lenses**

<table>
<thead>
<tr>
<th>design</th>
<th>name</th>
<th>types</th>
</tr>
</thead>
<tbody>
<tr>
<td>One curve</td>
<td>percon</td>
<td>Early to Moderate keratoconus (6.6-7.0mm)</td>
</tr>
<tr>
<td>Two curves</td>
<td>metro</td>
<td>Epithelial erosion and lens intolerance</td>
</tr>
<tr>
<td>Three curves</td>
<td>tricurve</td>
<td></td>
</tr>
<tr>
<td>Multi curves</td>
<td>maguire</td>
<td>3 diagnostic lens set 4 peripheral curves</td>
</tr>
</tbody>
</table>
Hybrid lens system

- **Design:** RGP center surrounded by a soft hydrophilic skirt.

- Soft perm lens
  Combined comfort

- **Indication:** RGP lens intolerance.

Hybrid combination

- Soft or hybrid lenses do not however prove effective for every patient.
**Piggyback contact lens**

- Rigid lens fitted on top of a soft lens.
- This an attractive option that requires no additional expertise to fit than other forms of hydrogel and RGP lenses.

**Fitting by piggy back CL**

- Fit the RGP lens approximately 0.3 mm FLATTER and 0.5 mm LARGER than if the lens was fitted directly onto the cornea.
Different challenging cases for fitting by RGP

- Keratoconus
- Keratoglobus
- Post Keratoplasty
- Post cross linkage
- After INTACS

Fitting Protocol

- 1. Reassurance
- 2. Explanation:
  The advantages and complications of contact lenses.
  The progression and the prognosis of the condition.
  The nature of the disease.
  Any cost implications.
- 3. Full slit lamp examination
- 4. Corneal topography
Golden Rules Of Fitting

- Corneal topography: just a starting point.
- Fluorescein patterns
- No single method
- A successful contact lens fit:
  - Allows the patient to wear the lens for many hours
  - Maximizes vision
  - keeps the corneal integrity intact.

Classification of Keratoconus in terms of the radius of curvature

<table>
<thead>
<tr>
<th>Grade</th>
<th>Corneal radius of curvature (mm)</th>
<th>Equivalent Diopters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early/Subclini</td>
<td>8.00-7.00</td>
<td>42-48</td>
</tr>
<tr>
<td>Moderate</td>
<td>6.90-6.50</td>
<td>49-52</td>
</tr>
<tr>
<td>Moderate/Adva</td>
<td>6.40-6.00</td>
<td>53-56</td>
</tr>
<tr>
<td>Advanced</td>
<td>&lt;6.00</td>
<td>&gt;56</td>
</tr>
</tbody>
</table>
Classification of Keratoconus according to the cone shape and position

**Nipple** 3-5mm lower nasal quadrant
**Bow-tie** central steepening
**Global** 5-6mm infero-temporal quadrant

Fitting Philosiphanies

- **Three point touch design**: (ideal fit)
- **Steep fitting**: (apical clearance)
- **Flat fitting**:
Lens Order

1. Diameter
2. Power
3. Base curve
4. Optical zone !!
5. Edge lift !!
6. Fenestration !!

Ideal fit in challenging cases

• Choose first trial lens: 0.3 mm flatter than the steepest meridian

**Assess in order:**
• 1. Central fit
• 2. Peripheral fit:
• 3. Diameter:
• 4. Location:
• 5. Movement:
<table>
<thead>
<tr>
<th>Cone</th>
<th>Fitting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low cones</td>
<td>Increase the diameter, flatten the base, increase the edge lift or Piggyback CL</td>
</tr>
<tr>
<td>Superior cones</td>
<td>Decrease the diameter, steepen the base, decrease the lift</td>
</tr>
<tr>
<td>Small steep cones</td>
<td>Flatten the base, decrease diameter and increase the edge lift or Piggyback CL</td>
</tr>
<tr>
<td>Advanced cone</td>
<td>Small diameter lens Regular follow up</td>
</tr>
<tr>
<td>Early cones</td>
<td>Larger diameter lenses with decreased edge lift</td>
</tr>
<tr>
<td>Astigmatic corneas</td>
<td>Decrease diameter, or toric</td>
</tr>
</tbody>
</table>

**Fitting after intacs**

- The irregularity in elevation created by the INTACS leads to difficulty in centering the lens on the eye

- Problems with bubbles forming under the contact lens over areas of corneal depression.
Rose k2 IC

- **Reverse geometry**
  RGP lenses are often successful for residual errors following myopic corneal refractive surgery and after Intacs in keratoconus.

Collagen cross linkage

- Collagen cross-linking treatment is not a cure for keratoconus, it aims to slow or even halt the progression of the condition.
- The hybrid lens can give good comfort with the vision of a rigid lens.
Fitting after cross linkage

- Irregular corneal profile
- Flat corneal curvature
- Mild haze
- Sensitivity
- Diameter is biggest factor in controlling centration

CL tolerability using hybrid CL before cross linkage
CL tolerability using hybrid CL after cross linkage

Fitting after keratoplasty

Most difficult fittings !!!

- Irregular corneal profile
- High degrees of astigmatism / often irregular
- Raised scar tissue at suture line/ often multiple
- Sensitivity
- Diameter is biggest factor in controlling centration
**Rose K2 Post Graft**

- Reverse geometry in flatter bases
- Large optic zone (aspheric) : covers graft
- Steeper peripheral curves than Rose K

**Take home message**

- Contact lenses either RGP, piggy back contact lens, hybrid lens or reversed geometry CL will be the treatment of choice in keratoconus, in some cases after cross linkage, after intacs or even after keratoplasty.
- In each challenging cases for fitting a special type of contact lens is needed.