A hyper Dk piggy-back lens system for keratoconus: a case report

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Background
Patients with keratoconus are most commonly fitted with RGP lenses to correct the myopic astigmatism that is usually present. Whilst RGP lenses are generally very successful in this group of patients, significant numbers experience discomfort and reduced wear times with the lenses. Other contact lens options which provide adequate levels of oxygen to these already compromised corneas, need to be utilised in such cases.

Objective
To report on the fitting of a hyper Dk piggy-back contact lens system in a case of keratoconus.

History
The patient was 54 years of age with bilateral keratoconus. She was referred to UMIST in 1994 after being unsuccessfully refitted with RGP lenses (having worn PMMA lenses for 20 years). She found RGP lenses uncomfortable and was experiencing reduced wear times and cosmetically unacceptable ocular redness. In 1995 she was fitted with SoftPerm lenses (CIBA Vision) to alleviate these symptoms. The lenses were worn relatively successfully for 7 years until the original symptoms (discomfort, reduced wear time and conjunctival hyperaemia) returned. Furthermore, she had developed corneal vascularisation due to the low Dk of the lenses and the long wear times required.

Examination
Slit lamp examination showed the classic signs of keratoconus with moderate limbal and bulbar conjunctival hyperaemia (Fig. 1a).

Figure 1a and b. Hyperaemia and vascularisation with SoftPerm lenses

Additionally there was corneal vascularisation (Fig. 1b) and staining present. Keratometry was R 7.32 al 120/7.06 al 30 and L 7.20 al 127/7.13 al 37. Refraction revealed R -8.25 / -2.00x160 6/9 and L -10.00DS 6/9 (12mm). These measurements were carried out immediately on removing the SoftPerm lenses and the true level of astigmatism is thought to have been masked due to corneal moulding (Fig. 2).

Figure 2. Corneal topography

Table 1. Details of the hyper Dk lenses used

<table>
<thead>
<tr>
<th>Material</th>
<th>Focus Night &amp; Day</th>
<th>Menicon Z alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equilibrium, trade centre</td>
<td>Lentar115 A</td>
<td>Triollox A</td>
</tr>
<tr>
<td>Dk (Barrers)</td>
<td>145</td>
<td>163</td>
</tr>
<tr>
<td>RGRZ (mm)</td>
<td>6.80 to 8.00</td>
<td>7.00 to 8.00</td>
</tr>
<tr>
<td>TD (mm)</td>
<td>1.00</td>
<td>1.10</td>
</tr>
<tr>
<td>RVP (%)</td>
<td>25.00 to 35.00</td>
<td></td>
</tr>
<tr>
<td>Replacement schedule</td>
<td>Monthly</td>
<td>Conventional</td>
</tr>
<tr>
<td>Wear schedule</td>
<td>Up to 30 days</td>
<td>Up to 30 nights</td>
</tr>
</tbody>
</table>

A preliminary investigation suggested that RGP lenses centre better when a plus power carrier is used. Therefore, the following Focus Night & Day silicone hydrogel lens was used: 8.40 / 13.80 / +3.00DS. K readings over the carrier lenses were R 6.95 al 90/6.90 al 180 and L 7.00 al 180/6.90 al 90. The mires were less distorted than those of the cornea itself. Menicon Z alpha trial lenses were then inserted on top of the carrier lenses: R 7.10/9.60/-8.00 and L 7.10/9.60/-8.00. These were found to be steep (Fig. 3a).

Figure 3a and b. Steep fitting (left) and alignment (right) fluorescein patterns

RGP lenses with flatter back optic zone radii were ordered: R 7.30/9.60/-7.50 and L 7.30/9.60/-9.00.

Results
At collection, the fluorescein patterns indicated an alignment fit (Fig. 3b) and visual acuity was 6/6 in both eyes. At 3 months the patient remains highly satisfied with the improved vision, wear time, comfort and cosmesis. Corneal staining, vascularisation and limbal and bulbar hyperaemia have reduced (Fig. 4).

Figure 4. The final piggy-back system showing reduced conjunctival hyperaemia

Conclusions
This piggy-back lens system satisfied the ocular and visual requirements of this patient where other options for vision correction had failed. This system has potential for visual rehabilitation after refractive surgery, keratoplasty and in cases of corneal trauma. Piggy-back lens systems are currently under-utilised despite requiring similar levels of expertise to fit as standard soft and rigid lenses. The hyper oxygen permeable lens materials currently available make these dual-lens systems a viable option in cases of corneal compromise.

Acknowledgement
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