The KBA is a clever new lens design

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Have you ever stopped to wonder about the strange dichotomy between the fitting philosophies used for designing 'standard' RGP lenses and those supposedly specifically designed for use in keratoconus?

In the former case, the ideal fit requires that the lens either centres properly or rides slightly high, has an even tear layer thickness under the lens and avoids areas of frank and heavy pressure on the cornea, and exhibits an even edge lift and active venturi effect around the periphery that limits the possibility of three and nine o'clock staining. Also, a larger lens diameter is better than a small diameter, as the larger optic zone reduces flare in dim illumination. The most important thing is to avoid low riding lens positioning.

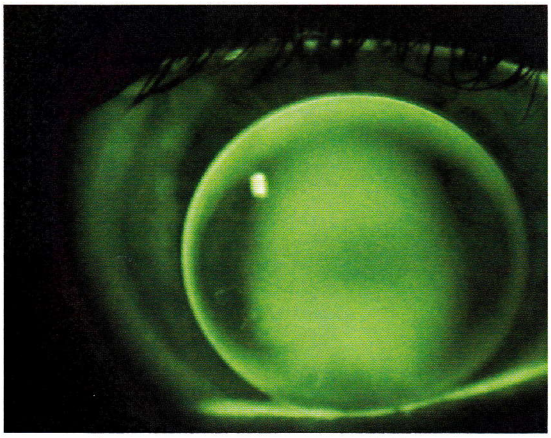

Figure 1. Low-riding fit common to conventional keratoconic lens designs

However, the opposite appears to be acceptable in keratoconus fitting. A low rider is acceptable, although uncomfortable, as the lens 'needs to centre over the cone apex', it is okay to have central touch, and it is acceptable to use a small diameter lens, even though the effects of edge flare and reflections can be visually disturbing at night time.

Optometrist Tony Phillips was the first person to directly question these assumptions with respect to keratoconus lens designs with his K1 and K2 lenses, about 10 years ago. His reasoning was that if you would not fit a normal eye with a small, steep, low-riding lens, why on earth would you want to fit a keratoconic eye with the same flawed fitting philosophy?

The K1 (9.50 mm) and K2 (9.80 mm) designs became the lens of first choice for those practitioners fitting a lot of keratoconus patients but, like most multicurve designs, they had their shortcomings.

Aspheric lenses for keratoconus have been around for years. One of the great Australian proponents of aspherics was Steve Zantiotis, who used the earlier designs with great success in his keratoconus patients. The real problem limiting the appeal of aspherics to general contact lens practice was the complexity of the design involved. Instead of a base curve and peripheral curves, there was an apical radius and eccentricity, and also the problem of induced radial astigmatism when the lens decentred.

Let us explain this a bit further. An asphere is described in terms of the apical radius, or the radius of curvature at the centre of the asphere along the optical axis. From the apical radius outwards, the radius flattens at a constant rate, the degree of which is determined by the level of eccentricity The cornea follows roughly the same principle. In keratoconic eyes, there is a steep apical radius and a high eccentricity, which equates to a rapid flattening of curvature from the centre to the periphery of the cornea.

If a lens is designed to mimic this effect, it is called an aspheric. There is only one problem with this type of design, and that is that at any given point on the lens surface, there are two different radii of curvature, the axial and tangential. If the lens is decentred with respect to the optical or visual axis, the combination of the differences in curvature produces marked degrees of coma and induced radial astigmatism. This results in exaggerated flare and poorer vision, especially at night. This is what limited the application of aspheric lenses in general practice, and more specifically with respect to keratoconic lens designs.

The KBA

The advent of CNC lathes for lens manufacture has meant that these problems can be overcome by the application of 'clever' optics to the lens design and manufacturing process.

The KBA lens is a highly aspheric back surface lens with a variable eccentricity and axial edge lift that allows the practitioner to base the required lens design for a particular

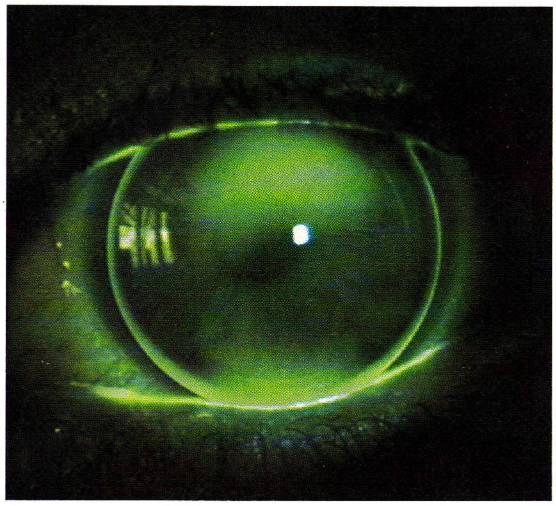

Figure 2. A KBA lens on the same eye