Lens file: Nissel K2 Rigid lenses

Karen Hughes continues our series looking at specialist contact lenses, by describing an RGP lens system for managing keratoconus

Nissel K2 Rigid is a complete system of rigid gas-permeable lenses designed to manage all stages of keratoconus. The lenses can be fitted to all keratoconic patients, whether early or advanced. Lens design options include toric peripheries, full bitorics and quadrant-specific geometry for asymmetric corneas. All lenses are delivered with aberration-control optics to provide best possible visual acuity at different lighting levels. All of the Nissel K2 lenses are manufactured and supplied by Cantor + Nissel in the UK using Optoform lathes (Figure 1).

Figure 1 Production director Garth Barnard pictured with the Optoform 40 lathe used to make Nissel K2 Rigid lenses

Applications

The value of rigid lenses in the management of keratoconus has been summarised by Gasson and Morris.[1] Keratoconus is the classic case in which a rigid contact lens provides a new refracting surface for an irregular cornea and gives improved acuity, whereas spectacles frequently offer no significant benefit. Corneal lenses are therefore the preferred form of correction in the early stages of the condition.

The apex of the cone is usually displaced inferior and nasal relative to the pupil. The common problem in all keratoconus fitting is to make the back optic zone diameter (BOZD) of the lens, which tends to centre at the apex of the cone, sufficiently large to cover the pupil area without the formation of either dimples or a stagnant pool of tears. Another problem is that, in the mid-periphery, all spherical lenses are tightest where the cornea is flattest, which may result in lenses either impinging excessively onto the superior limbus or dropping to an uncomfortable low position.

Keratometry readings in keratoconus are typically steep, astigmatic and irregular, except in the early stages. As the cone advances, readings may fall outside the measurable range of the instrument, although modern autokeratometers have a greater range and can sometimes gives readings as steep as 4-5mm. Corneal topographers are ideal and can help with the selection of the first lens.

Technical features

The distinguishing feature of the Nissel K2 Rigid system is that all trial lenses, in common with all the company's RGP designs, are single use, removing concerns about trial lens disinfection and management.

The Nissel K2 is available in a wide range of base curves, diameters and edge lift options, and is manufactured from the high permeability material Optimum Extra (Contamac) as standard, with other materials available to order. Table 1 lists the lens features and parameters, although variations on these may be possible on request. For optimal vision and comfort, Nissel K2 Rigid lenses should be replaced every 6-12 months.

Fitting sets containing single-use mid-Dk material diagnostic lenses are recommended to reduce chair time; trial lenses used from the diagnostic set are replenished at no charge. All trial lenses are engraved with their base curve for easy identification, which is useful when multiple trial lenses are used in the consultation.

TABLE 1 Summary of technical features

Materials, manufacture and use	Design and parameters
Optimum Extra as standard	Total diameter 8.70 standard
Dk (Fatt/ISO) 110/82	Other diameters 8.10mm, 8.40mm, 9.00mm, 9.30mm
Blue tint as standard	Edge lift a) Standard b) Increased 1-step, increased 2-step c) Decreased 1-step, decreased 2-step Edge lift increments provide clear clinical step changes to lens peripheral fit
Light blue, grey, green tints to order	BVP ±30.00DS Aberration-controlled aspheric optics are standard on all Nissel K2 Rigid lenses
Other materials available on request	BOZR steepest available 4.80mm
	Toric periphery, back surface toric, bitoric and quadrant-specific lens geometries available

Fitting procedures

If a corneal topographer is used, then the flatter simulated keratometry (often labelled as 'Sim K' in topographer software) reading should be noted; if a keratometer is used then the average of the flat and steep K readings should be calculated. The first trial lens taken from the 8.70mm diameter Nissel K2 trial set should have a base curve which is as close as possible to 0.30mm steeper than the value obtained.

The aim of the fitting procedure is to provide good acuity in a lens that is comfortable and which will continue to enable comfortable wear. The ideal fit (Figure 2) will exhibit good centration, have minimal clearance or light 'feather touch' at the apex of the cone, combined with as close to alignment as possible over the cornea. A band of edge clearance 0.50 to 0.80mm wide should be evident.

Use of a short-acting topical anaesthetic is recommended to reduce tearing and to enable better assessment of the fluorescein pattern.

Assessing the central fit

Central fit assessment is carried out using fluorescein and preferably a

yellow filter (Wratten #12). Ideally there should be a small amount of apical clearance although very light apical touch ('feather touch') is acceptable. Note that while flat, central fitting with corneal touch may improve acuity, it can prove detrimental to corneal health in the medium and longer term. A fitting pattern showing apical clearance and pooling is acceptable provided the visual acuity is satisfactory.

Assessing the peripheral fit

The optimal peripheral fit should display a fluorescein band of 0.50 to 0.80mm, as shown in Figure 2. This edge clearance will enable correct lens movement and facilitate tear exchange. Since there will usually be some toricity to the edge clearance, it should be assessed along both the flat and steep meridians. If it is considered that a toric periphery lens – or a full back toric – is required, then these lens geometries can be supplied as part of the Nissel K2 Rigid system.

Adjusting the edge lift

The fitting sets are supplied with each base curve having a carefully calculated standard value of edge lift. In the case of keratoconus, the design of the peripheral area is markedly different from standard lenses which are designed to fit eyes with normal topography. The axial edge lift of the Nissel K2 Rigid lens can be increased or decreased in increments which are calculated to produce clinically evident step changes in the peripheral fit; when these step changes are selected, the complete edge profile is altered so as to allow for the likely topography of the keratoconic eye. Each base curve is therefore available in a choice of five edge lifts.

Selecting the best lens diameter

The 8.70mm diameter should be suitable in most cases. In advanced cones, the smaller 8.10mm option may be appropriate. The total diameter of the lens is incremented/decremented in steps of 0.30mm; however, the lens diameter should only need to be altered in advanced or very toric cones.

If the lens is riding high then a smaller diameter should be ordered and if the lens is riding low then a larger diameter option should be tried. If 3 and 9 o'clock or superior limbal staining is present then this can often be reduced by decreasing the diameter and/or increasing the edge lift.

Lens power

As the power of the trial lens may vary significantly from the final lens power required, an over-refraction should be carried out, using 1.00D steps initially, followed by 0.50/0.25 to refine.

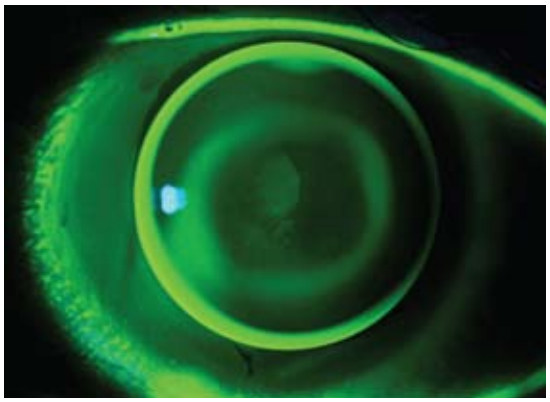

Figure 2 Ideal fit for Nissel K2 Rigid. Good centration, close central alignment and an adequate band of edge clearance (Image courtesy of Andrew Gasson)

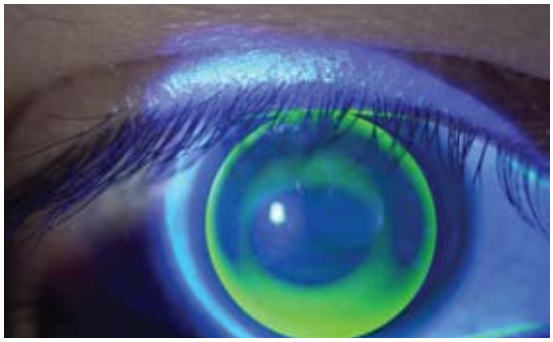

Figure 3 Standoff in the inferior quadrant can cause discomfort but may be resolved by using the quadrant-specific option in the Nissel K2 Rigid lens system (Image courtesy of Andrew Gasson)

Toric or spherical?

Although measurement of the central cornea in keratoconus can indicate significant amounts of corneal toricity, the peripheral cornea is often spherical. Often the best visual acuity may be achieved with a spherical optic zone. Because of this a toric lens should only be ordered when the best fitting spherical lens is unsuccessful. The specified base curve of the lens should be assessed along the flattest meridian (typically the horizontal).

The full sphere/cylinder over-refraction can be assessed once the suitable toric fit is achieved. In cases where the central pooling pattern and acuity are acceptable but the edge profile is too flat in one meridian, a toric periphery can be ordered.

Fitting the asymmetric keratoconic cornea

The keratoconic cornea is frequently asymmetric, and often highly asymmetric, with the inferior quadrant of the cornea significantly steeper than the superior.[2,3] This can cause rigid lenses to exhibit 'standoff' at the 6 o'clock position (Figure 3).

With fast-tool servo manufacturing technology the lens' back surface can be designed to have a different geometry in each of four quadrants, enabling a lens design which can align with the asymmetric keratonic cornea. Quadrant-specific design can be used to enhance lens comfort and stability, resolve lens displacement from lower lid interaction, and deliver superior visual performance. Typically, the inferior quadrant of the lens is manufactured steeper than the superior and lateral quadrants providing better inferior (6 o'clock) alignment.

Quadrant specific design options are available for all Nissel K2 Rigid lenses. In cases where the fitter considers this design option would be appropriate they should call the professional services team for help with the lens specifications. Using the Nissel K2 quadrant-specific design can improve the lens cornea relationship, promoting comfort, lens positioning and corneal health, while reducing the clinical time required to arrive at the best lens fit.

Conclusion

The Nissel K2 Rigid keratoconus lens has been developed by Cantor + Nissel to be easily delivered in modern hospital and specialist clinic environments. The availability of single-use, no-cost, trial lenses eliminates the need for the disinfection and management of trial lenses.

New manufacturing technology has led to improved reproducibility and consistency of product. Lenses can be customised to patients' requirements with a large range of parameters available. The fitting procedure is straightforward, enabling a successful outcome with minimal clinical time. The Nissel K2 Rigid system is a valuable addition to the range of options for managing keratoconus.

References

1 Gasson A and Morris J A. *The Contact Lens Manual Fourth Edition* ISBN 978-0-7506-7590-1 published by Butterworth Heinemann 2010.

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3 Burns DM, Johnston FM, Frazer DG *et al.* Keratoconus: an analysis of corneal asymmetry. *Br J Ophthalmol,* 2004;88:1252-1255.

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