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The future of RGP lenses? Larger-diameter and hybrid lenses offer all of the benefits of RGP lenses with the comfort of a soft lens

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C-16503 2 CET points for optometrists and contact lens opticians

For many of us new rigid gas-permeable (RGP) fits are becoming a rare occurrence and our existing RGP wearers are becoming an elderly group (Morgan 2008). What is the reason for the demise of the RGP corneal lens – and should we be concerned?

Over the past 15 years, soft lens technology has taken giant leaps forward. With the advent of daily disposables, comfort agents, new multifocal designs, high-*Dk* silicone hydrogel (SiHy) materials and even SiHy soft lenses for keratoconus (White 2010), it sometimes feels that there is no eye that can't be approached with soft lenses. Soft lenses have many benefits, perhaps the greatest being that they are usually immediately relatively comfortable, even for a neophyte contact lens wearer. In addition they can be easy to fit and multipowered fitting banks are readily available, giving instant gratification to our patients.

Although it seems that there are a plethora of lenses to choose from nowadays, the majority are designed to fit the 'average' eye and are usually only available in limited base curves. The majority of patients are still wearing relatively low-*Dk* hydrogel materials and the transition to SiHy is not always smooth (Morgan 2008). But perhaps the greatest drawback becomes apparent when we try to fit patients with astigmatism. Soft lenses for astigmatism need to orient themselves in the correct position in order to be totally effective. For higher amounts of astigmatism rotation can affect visual acuity quite dramatically (Myers et al. 1989; Tomlinson et al. 1994) and SiHy lenses are few and far between, meaning that most lenses are made of much lower-*Dk* materials (Kerr 2010). Their increased thickness, especially inferiorly, which is needed for stabilisation, can cause oxygen issues (Bergenske 2006; Eghbali et al. 1996). As for multifocal lenses for astigmats, the choices are even further reduced (Kerr 2010).

The biggest drawback for soft lenses is the biggest advantage of RGP lenses. As well as in general providing better visual correction (Fonn et al. 1995; Hong et al. 2001; Tomlinson et al. 1994), RGP lenses can correct corneal astigmatism directly by creating a spherical tears lens (Phillips & Speedwell 2006). As the refractive index of tears is so similar to the cornea, corneal astigmatism is almost completely neutralised. In addition, a wide variety of high-*Dk* materials are available (Kerr 2010). Lenses usually have good wetting, are resistant to dehydration and an argument can be made that there is a lower microbial keratitis rate in RGP wearers (Morgan et al. 2005).

So why aren't we rushing to fit our astigmatic patients with RGP lenses? There are a number of factors, but perhaps the most important is that RGPs require a substantial period of adaptation before they become comfortable (Fonn et al. 1995; Gill et al. 2010; Hunt et al. 2007). Overall, practitioners are now more reticent to mention RGPs to their patients (Gill et al. 2010). It seems that only the irregular cornea patient is offered RGPs as a first-choice lens these days.

We often think that comfort issues with rigid lenses are due to the rigid material but in fact they are due more to their small size, which allows lid interaction and corneal sensation (McNamara et al. 1999; Williams-Lyn et al. 1993). In fact corneal lenses were only introduced in the 1950s by Kevin Tuohy, who inserted a scleral lens after the haptic portion had accidently been cut off and realised that using a smaller lens gives tear exchange, which helps to overcome the problems of corneal oedema (or Sattler's veil) found with the prevalent polymethyl methacrylate (PMMA) scleral lenses (Bennett & Weissman 2004). Larger-diameter lenses are far more comfortable than corneal lenses as they have less lid interaction and movement (Laurent 2009; Williams-Lyn et al. 1993). With the advent of highly gas-permeable materials in the 1980s, oxygen issues with rigid lenses became a thing of the past but their small size remained (Mireskandari et al. 2004). In recent years, due to practitioner demand, contact lens manufacturers have realised the potential of returning to larger-diameter designs to allow patients the vision of an RGP lens with the comfort of a soft lens. In addition, larger-diameter lenses can give better vision than corneal lenses due to their excellent centration and their ability to correct higher amounts of astigmatism without the need for back surface toricity.

This larger diameter can be achieved simply by making the rigid lens larger or by attaching a soft skirt to a corneal RGP centre (this is known as a hybrid lens). In both cases the lenses are lathed on standard RGP lathes and are highly reproducible. Hence we now have the opportunity to offer our patients with astigmatism and irregular corneas all the benefits of a rigid lens without comfort being the issue. This article will introduce the reader to both larger-diameter RGP lenses and hybrid lenses for normal and keratoconic corneas.

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Hybrid lenses

Hybrid lenses are those with a central optical part made of a rigid material attached to a soft skirt (Figure 1). Some practitioners may remember the first incarnation of a hybrid lens, the now defunct SoftPerm (CIBA). This lens did not give hybrid lenses a good reputation as it suffered from oxygen issues due to the low *Dk* of both the centre and skirt. The lens also had a tendency to fall apart. However, there is now a second incarnation of the hybrid lens, called the SynergEyes lens (from SynergEyes) which, rather than being a redesign, is more of a reimagination. There are designs for normal corneas (A series), keratoconus and irregular corneas (KC and ClearKone series) and postsurgery (PS series). There is also a multifocal version of the A series.

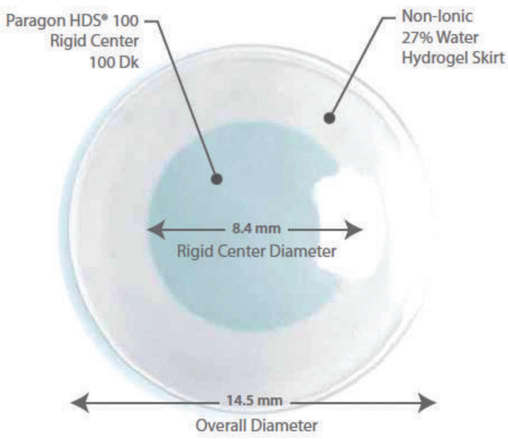

Figure 1. The SynergEyes hybrid lens.

Figure 1 shows the SynergEyes A lens. It has an 8.4mm central rigid portion attached by an extremely strong, patented bond to a hydrogel skirt. The back optic zone diameter is 7.8mm and the total diameter of the lens is 14.5mm. The lens is available in 10 base curves from 7.10 to 8.00mm in powers from +20 to −20, with two skirt curve options.

The main fitting aim for these hybrid lenses is that the RGP portion of the lens just clears the central cornea (apical clearance) whilst the soft lens is aligned in periphery. Hence in order to vault the central cornea the initial base curve is chosen to be 1.00D steeper than flattest K; however if there is significant astigmatism over 1.50D, then 1.50D is more appropriate. The flatter skirt curve is always chosen in the first instance.

Perhaps the most unfamiliar aspect of hybrid lens fitting is the insertion process, as the lens must be inserted filled with saline. In order to keep the saline in the lens the patient must lean forward and drop the head so that the patient is looking at the floor. The practitioner then brings the lens up from below, placing it gently on to the cornea (Figure 2a). During the fitting process one drop of high-molecular-weight fluorescein must be added to the saline in the lens; normal fluorescein cannot be used, as it will be absorbed by the hydrogel skirt.

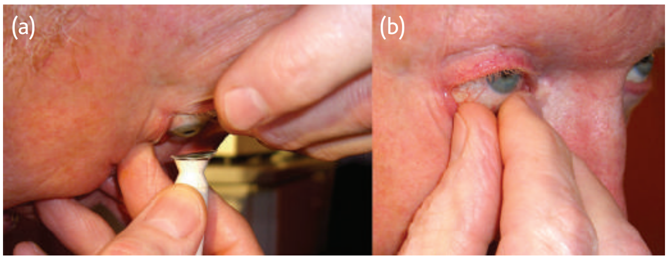

Figure 2. (a) Hybrid lens insertion. The lens must be filled with saline before insertion. (b) Removing a hybrid lens.

Figure 3b shows the ideal fit of the SynergEyes A lens. Slight fluorescence should be seen under the central part of the lens, indicating apical clearance and light landing of the lens at the RGP–skirt junction with alignment of the soft skirt. Figure 3a shows a flat central fit, with bearing of the lens on the central cornea. Due to the increased weight of the SynergEyes lens compared to an RGP lens this will cause significant discomfort and in this case the base curve should be steepened. Figure 3c illustrates a steep central fit, with significant fluorescein pooling in the centre. This increased pooling can often cause an almost limpet effect which sucks the lens on to the eye, and this becomes very uncomfortable after a while. In this case a lens with a flatter base curve should be used.

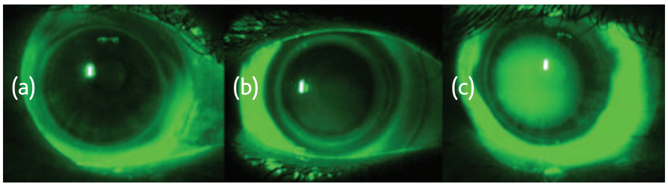

Figure 3. (a) Flat fit; (b) ideal fit; and (c) steep fit of a SynergEyes A lens.

Once the final base curve is chosen then the skirt curve can be assessed. A steeper skirt curve should be used if edge fluting of the skirt is observed or if there is a dark ring of bearing at the junction of the rigid centre and soft skirt or pooling under the periphery of the soft skirt. Once the final lens has been chosen an overrefraction should be performed and the lens ordered, giving the base curve, the skirt curve and the power required. To improve comfort it is possible to order the lens with a peripheral blend that softens the landing of the junction area. It is also possible to order the lens with a thicker RGP portion (called enhanced profile) if there is flexure of the lens reducing visual acuity.

A hybrid lens is removed (Figure 2b) by having the patient look straight ahead or slightly upwards, then, with dry fingers, the lens is pinched at the 6 o'clock position. This should break the surface tension and the lens will easily come away from the cornea. The lens has a 6-monthly replacement schedule and its recommended care regime is a hydrogen peroxide system.

Corneoscleral and miniscleral lenses

Most of us in practice have either a keratometer, or if we are more fortunate, a topographer. In the best case we know the curvature of the central 3–8mm of our patients' corneas. However, the diameter of these large lenses ranges from 13 to 16mm, so when fitting them the curvature of the central cornea becomes almost irrelevant as we are trying to fit not only the cornea but also the limbus and the sclera. In fact the most significant factor to be considered when fitting large-diameter RGPs is the sagittal depth (sag) of the eye – this is the depth of the eye at the diameter of our lens. Sagittal depths of the normal eye can range from around 2.5 to 4.0mm at a 15mm diameter.

Knowing the keratometry values of a normal cornea is useful in that in general the steeper the base curve, the deeper the sag of the eye but the sag also depends on the eccentricity of the cornea and on the size of the eye, which is related to the horizontal vertical iris diameter (HVID) (Young 1992). In general, the larger the HVID, the greater the sagittal depth of the eye. Previous studies of the shape of the eye were undertaken by making moulds, a very time-consuming process; however, with the advent of ocular coherence tomography (OCT), the study of the shape of the eye has become far easier and studies are underway (Caroline et al. 2010) that may help us understand more. Perhaps in the future we will fit our lenses empirically using OCTs. For now though, for most of us in practice, it is not possible to measure the sag of the eye directly and hence we must use fitting sets to identify the correct lens for the eye.

The diameter of these large RGPs ranges from 13 to 16mm. Some lens designs aim to vault the cornea completely, hence they are true sclerals, whilst others rest some weight on the cornea as well as the sclera – these are known as corneosclerals. Most designs are aimed at the irregular cornea but there are lenses aimed at normal eyes. For all lenses the aim is to fit the sag of the eye (either with or without vault) and align the periphery of lens with the sclera.

One such lens for normal corneas, that is available in the UK, is the SoClear lens (No7 Contact Lenses). The SoClear lens is a corneoscleral lens that is available in diameters from 13.3 to 15.5mm (Figure 4). The standard fitting set contains 18 lenses with base curves from 7.11 to 8.65 (in 0.50D steps, as it is an American design). It seems incorrect that the lenses are marked with base curves when we are trying to fit sagittal depth. However, the SoClear is designed so that each lens base curve has an associated sag that should match the sag of an average eye with that central curvature. We know that a steeper cornea is usually associated with a higher sagittal depth and we can see, for example (Figure 5), that the 7.11 lens has a much greater depth than the 8.65 lens. Hence the nomenclature of the lenses functions to help the practitioner decide which lens to start with. However, it should be borne in mind that for eyes with larger than average HVIDs we would expect a greater sag than average and for those with smaller than average HVIDs a lower than average sag. Hence for eyes with average-size corneas (between 11.5 and 12.5) the first-choice lens is that closest to mean K, whilst for larger HVIDs a 1D steeper (two fitting steps) lens is chosen and for smaller than average HIVDs (below 11.5) a 1D flatter lens is selected.

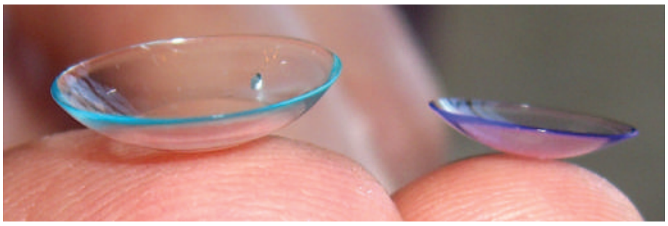

Figure 4. The SoClear lens, compared to a corneal rigid gas-permeable lens.

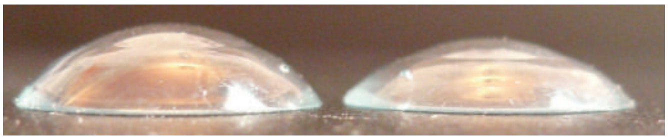

Figure 5. Different sagittal depths of corneoscleral lenses.

The fitting process is similar for most designs. The lens can be inserted in a similar manner to hybrid lenses, filled with saline; however this time it is filled with normal fluorescein. The ideal fit for a corneoscleral lens will show alignment (as opposed to central clearance for scleral designs), with a band of limbal clearance and alignment of the periphery of the lens with the sclera, as shown in Figure 6.

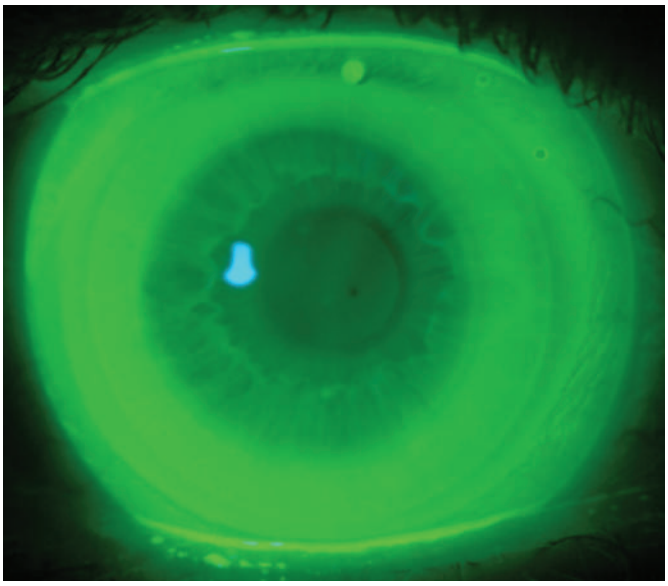

Figure 6. Ideal fit of corneoscleral lens shows central and scleral alignment.

Unlike RGP fitting, there should not usually be a need for anaesthetic; in fact, comfort is a useful aid in choosing the correct lens. A lens that is a poor fit will most likely be mildly uncomfortable whilst a well-fitting lens will feel very comfortable. If it is not possible to make the lens comfortable then this may not be the lens for this patient. A flat-fitting lens is particularly easy to spot; it may well be uncomfortable as the lids interact with the lens. There may also be central bearing and it is key to look also for flaring away of the lens at the sclera (Figure 7). This is very easy to spot through the slit lamp. If the lens is too flat a higher sag is required (in the case of SoClear, a steeper base curve). A steep lens is harder to spot (as for an RGP) – the signs are excessive central clearance and scleral impingement, possibly with vessel blanching and persistent large bubbles (Figure 8). The lens will become uncomfortable after a while. A good fitting strategy is to fit flatter and flatter until the lens becomes obviously flat and then go back one or two steps. An overrefraction should be performed on the best-fitting lens.

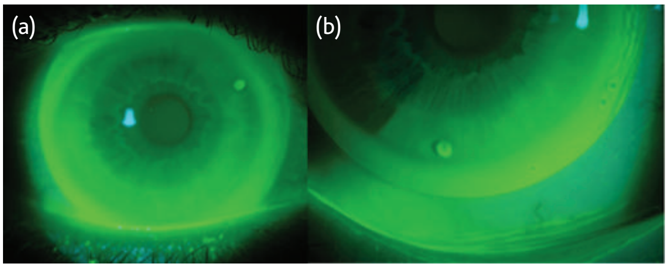

Figure 7. Flat fit of corneoscleral lens may show: (a) central bearing and (b) flaring at the edge of the lens.

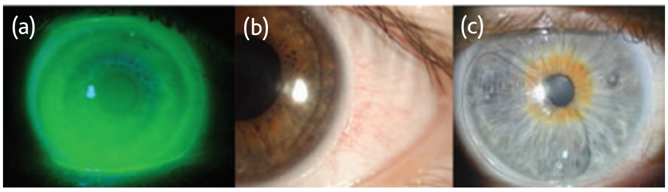

Figure 8. Steep fit of corneoscleral lens may show: (a) central clearance, (b) vessel blanching and (c) large bubbles.

Once the sag of the cornea and the periphery are fitted then the final task is to look at the midperipheral fit. Midperipheral clearance is important to facilitate tear exchange. Too little clearance can lead to adherence, staining and, in the worst-case scenario, because of a lack of tear exchange, oedema. On the other hand, too much can lead to central staining and bubble formation at the midperiphery. Some lens designs, such as Mini-Scleral Design from Blanchard Labs (USA), allow you to order directly a higher or lower midperipheral clearance (Figure 9). For the SoClear lens the

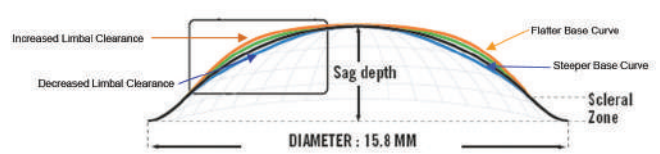

Figure 9. Altering the midperipheral clearance of a miniscleral design lens.

midperipheral clearance is altered by ordering the lens with the peripheral system and hence sag of the lens that fits the centre and periphery with an altered central curve only. Counterintuitively, due to the fact that sagittal depth remains constant, to attain more midperipheral clearance the central curve must be flattened, and to decrease the midperipheral clearance the central curve must be steepened (Figure 9). For example, to increase the midperipheral clearance when the 7.67 lens gives the best central and peripheral fit, order the 7.76 periphery with the centre of the lens two steps steeper, using the steeper add minus, flatter add plus (SAMFAP) rule to calculate any changes to the power required.

Figure 10 shows a SoClear lens with the same sag but with progressively flatter central curves; it can be seen that by flattening the central curve, first by one step (of 0.50D), then by a second step, the lens lifts away from the midperiphery. Or, alternatively, by steepening the central curve the lens can be brought down on to the midperiphery.

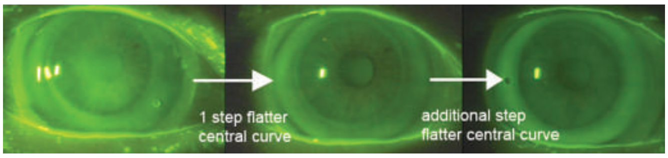

Figure 10. Altering the central base curve whilst keeping the sagittal depth the same changes the midperipheral clearance of SoClear lens. The central curve is made progressively flatter from left to right, which increases the midperipheral clearance.

RGP lens solutions can be slightly viscous for this lens, hence soft lens solutions are suitable for lens care. However, the lens should always be inserted with saline rather than solution with replacement on an annual basis.

The patient can build up wearing time in a manner similar to soft lens wear.

Keratoconus

When it comes to irregular corneas due to conditions such as keratoconus the sag of the eye becomes far more unpredictable as it depends on both the severity of the condition and the underlying anatomy of the eye. It certainly cannot be predicted reliably from the base curve of the central cornea, as this is a measure of steepness and the cone may be very steep but not deep. Hence when fitting irregular corneas a fitting set is essential and the first-choice lens is chosen almost with intuition as topography may not be informative (Taylor-West & Hodd 2010).

For this reason many lens designs dispense with the notion of base curve, and their fitting sets are based on sag only. Others, such as SoClear, still use base curve but are again just a set of increasing sag lenses and should be thought of in this way. In fact around 70% of keratoconic patients can be fitted with the standard SoClear set. The keratoconic set itself contains higher sag lenses with an aspheric design. The notion of base curve needs to be completely forgotten as, instead of making the lens steeper with each fitting step, we are now increasing the sag. For all designs some vault of the cornea is desired. The Mini-Scleral Design from Blanchard Labs (USA) for instance has sags from 3.60 to 5.60mm in 0.1 steps (at a 15.8mm diameter). The aim is to have around 200µm clearance over the central cornea. The Jupiter lens (15mm) from Medlens (USA) fits in a similar way but has one great advantage in that it can be ordered with scleral toric zones if necessary and also a front surface toric can be added to correct residual cylinder. Figure 11 shows an ideal fit for a corneoscleral lens.

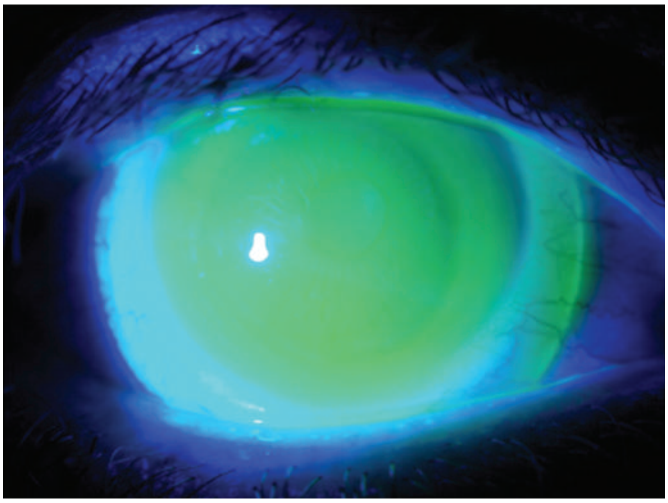

Figure 11. Ideal fit of corneoscleral lens for keratoconus.

Hybrid lenses for keratoconus

The hybrid lens for irregular corneas, ClearKone, also approaches fitting based on the sag of the eye, which in this case is referred to as vault (Figure 12) (Hodd 2010). The fitting set contains vaults from 100 to 600μm in 50μm steps, with each lens supplied in two skirt curves, medium and steep (flat is available on request). What is useful about these lenses (apart from their comfort) is that the curvature of the front surface remains relatively flat: this means that the power of the lens remains quite low and as the optical centre is centred over the visual axis rather than over the cone, aberrations are lower. It is possible that visual acuity with this lens may be better than the equivalent corneal RGP lens (Figure 13) (Nau 2008). Another good point is that with each step in vault the tear lens changes in a predictable fashion. To take advantage of this fact the back vertex powers of the fitting set lenses are calibrated so that for all lenses the overrefraction will be the same. Hence a lens with a 600 vault and 100 vault, for instance, in the same eye will have the same overrefraction. This means that as long as the overrefraction has been performed with one of the lenses, the necessary power of any of the other lenses can be calculated empirically.

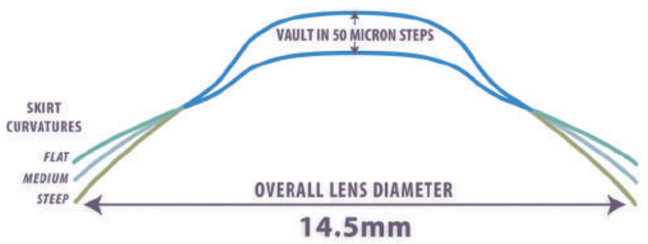

Figure 12. The ClearKone hybrid lens fits the sagittal depth of the irregular cornea.

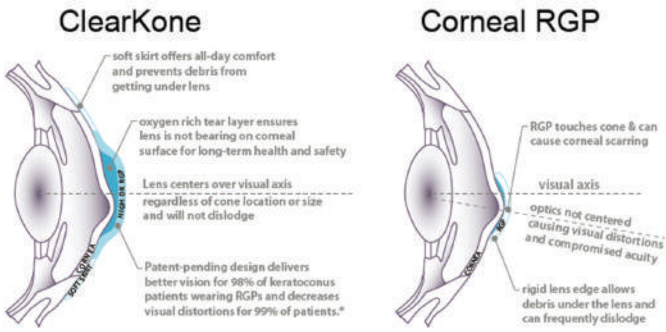

Figure 13. The ClearKone design may give better visual acuity than a rigid gas-permeable (RGP) lens.

Due to the fact that most of us have no means of directly measuring the sagittal depth of the eye, the recommended starting point for the ClearKone lens is the 250μm vault with the medium skirt. In trials SynergEyes found that half the patients needed a greater vault and half a lower one, so it seems a sensible place to begin. The lens is inserted as other hybrid lenses with one drop of high-molecular-weight fluorescein to assess the fit. The lens should be assessed within a few minutes of insertion. The aim of the fit is to vault the central cornea and usually the final lens is that with 100μm more vault than the first bearing lens. If the first lens is applied and shows central bearing on the cornea (Figure 14a) then it can be removed immediately and a lens with 100μm higher vault applied. If there is still bearing another 100μm increase should be made; this continues until there is apical clearance. If the first lens gives excessive central clearance (Figure 14c) then the vault should be decreased in 100μm steps until bearing is seen, and then increased until no bearing is seen. Again the final lens is that which is 100μm above the first bearing lens. The final lens chosen should fit like Figure 14b, with complete but not excessive apical clearance. There may be thinning over the cone but no touch is permitted.

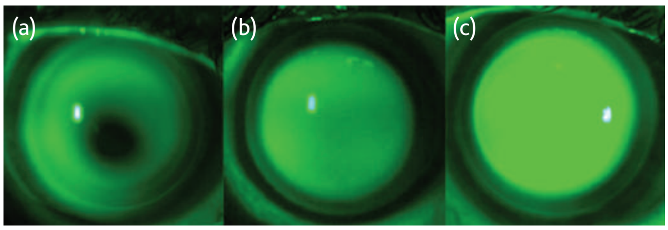

Figure 14. (a) Central bearing; (b) ideal fit; (c) excessive vault of the ClearKone lens.

Once the central fit is determined the skirt curve should be considered. At the area where the RGP lens meets the junction with the soft skirt (referred to as the inner landing zone (ILZ)), there should be thinning of the fluorescein. The lens should show bearing of the soft skirt (outer landing zone (OLZ)) (Figure 15b). If there is heavy bearing at the ILZ (Figure 15c) then a steeper skirt is required; if there is pooling (Figure 15a) then a flatter skirt is required. Finding the correct skirt curve can often improve lens comfort significantly.

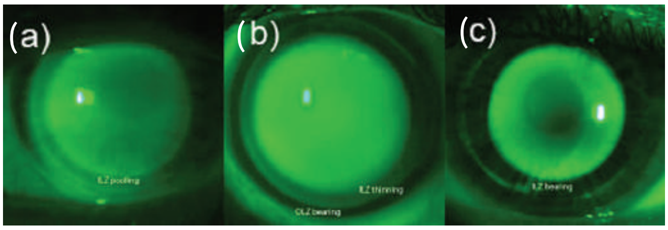

Figure 15. Assessing the skirt curve for the ClearKone Hybrid Lens: (a) inner landing zone (ILZ) pooling; (b) ILZ thinning; and (c) outer landing zone bearing and ILZ bearing.

It is advisable to carry out a tolerance test of at least 30 minutes to check that the lens does not settle back on to the cornea to the point that it touches it centrally. This will be indicated by discomfort and staining. If this is the case the vault should be increased by 50µm.

The ClearKone lens is very useful for many irregular corneas but for cases of pellucid and very decentred cones care must be taken to ensure that the junction area does not bear on the protruding area. If this cannot be avoided then ClearKone may not be the appropriate lens for this patient.

The whole fitting process is relatively quick and there is not even any need for topography data, hence this is a good lens when a quick and comfortable solution is needed.

Multifocals

As the UK population ages, presbyopes are a growing market (Bennett 2008). Many want to remain spectacle-free and why shouldn't they? Yet, often for our astigmats their only choice is monovision. There are fewer soft lens options for astigmats and it can be hard to separate whether poor visual acuity is due to the toric part or the multifocal part of the lens. As rigid lenses correct all corneal astigmatism directly they are a good choice for presbyopic astigmats. Multifocal designs are available for hybrid lenses and corneoscleral lenses from SynergEyes and SoClear respectively. The lenses are both simultaneous-vision designs that have a near segment at the centre of the lens (Figure 16). The excellent centration of these lenses should hold the near spot in front of the pupil. SynergEyes is available with either a 1.9 or 2.2mm segment size with adds from +0.75 to +2.25 in 0.50D steps. SoClear has adds up to 3.50D with segment sizes of 1.5, 1.75, 2.0 or 2.25mm. It is usual to give the dominant eye a smaller segment size and a slightly lower add, to allow for good distance vision. For the non-dominant eye a larger near segment is given with the full reading add. Problems occur, as with other multifocals, if the pupil size is small or if the lens does not centre well. The patient will need time to adapt to simultaneous vision.

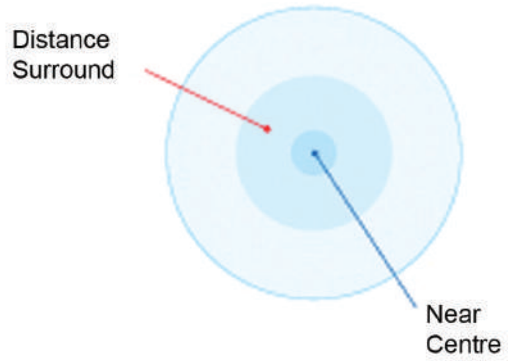

Figure 16. SynergEyes multifocal design has a near centre and distance surround.

Conclusions

It seems clear that corneal RGP fitting has declined due to the initial discomfort and long adaptation period required. This has led to practitioners becoming deskilled in RGP fitting and reticent to mention them to our patients at all (Gill et al. 2010; Hunt et al. 2007). It is true that for many eyes soft lenses are a completely appropriate option. However, many patients with astigmatism are putting up with poor visual quality without knowing that a rigid lens would solve their problems. We now have available to us large-diameter rigid lenses and hybrid lenses that offer all the comfort of a soft lens with the visual benefits that a rigid lens provides. Fitting them requires thinking in a slightly different way but practitioners willing to do this will find it a very rewarding experience.

Summary

In recent years the number of new RGP fits has declined and for most practitioners a soft lens is used as the first choice. However, there are situations where the visual acuity offered by RGP lenses is significantly better than that with soft lenses, for example, for cases of moderate to high corneal astigmatism, presbyopia (especially with astigmatism) and for irregular corneas. The decline of the corneal RGP may well be partly due to the initial discomfort and adaptation period required. This review article describes a new generation of RGP lenses that aim to give the comfort of a soft lens with the vision of an RGP. This comfort is achieved either by making the lens larger or by the addition of a skirt made of a soft material.

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Multiple choice questions

This paper is reference C-16503. Two points are available for optometrists and contact lens opticians. Please use the inserted answer sheet. Copies can be obtained from Optometry in Practice Administration, PO Box 6, Skelmersdale, Lancashire WN8 9FW. There is only one correct answer for each question.

1. The reduced initial comfort with rigid contact lenses is mainly due to which of the following?

(a) The stiffness of the material
(b) The poor wettability of the material
(c) Lid interaction due to their small size
(d) Reduced tear flow beneath the lens

2. Which of the following is an advantage of larger-diameter rigid lenses when compared to smaller rigid lenses?

(a) Improved comfort
(b) Improved centration
(c) Improved ability to correct higher amounts of corneal astigmatism without back surface torics
(d) All of the above

3. If a patient has 1D of corneal astigmatism and a flattest K reading of 8.10mm, which initial base curve should be ordered in the SynergEyes A lens?

(a) 8.20
(b) 8.10
(c) 8.00
(d) 7.90

4. Regarding SynergEyes fitting, which of the following statements is incorrect?

(a) If the patient's astigmatism exceeds 1.50DC then the initial back optic zone radius should be 1.50D flatter than the flattest K reading
(b) The flatter skirt curve is always chosen in the first instance
(c) A flat central fit with bearing on the cornea will be the most comfortable fit
(d) High-molecular-weight fluorescein is added to the saline in the lens

5. Regarding SynergEyes fitting, which of the following statements is incorrect?

(a) A steep central fit can suck the lens on to the eye
(b) The skirt curve should be assessed prior to the base curve
(c) If edge fluting of the skirt is observed a steeper curve should be chosen
(d) A peripheral blend can be ordered to improve comfort

6. What is the replacement schedule of a SynergEyes lens?

(a) Monthly
(b) Quarterly
(c) Six-monthly
(d) Annually

7. What is the most important factor to consider when fitting large-diameter RGP lenses?

(a) Sagittal depth
(b) Central corneal curvature
(c) Peripheral corneal curvature
(d) Horizontal visible iris diameter

8. Regarding sagittal depth, which of the following statements is incorrect?

(a) Generally the steeper the central base curve, the deeper the sag of the eye
(b) Generally the larger the HVID, the smaller the sagittal depth of the eye
(c) Corneal eccentricity will influence the sag of the eye
(d) For most community practitioners it is not possible to measure the sag of the eye directly

9. When fitting SoClear lenses to a patient with an HVID of 11mm, the initial lens selected should be:

(a) Closest to mean K
(b) Two steps flatter than closest to mean K
(c) Two steps steeper than closest to mean K
(d) One step flatter than closest to mean K

10. Regarding the midperipheral fit of a SoClear lens, which of the following statements is incorrect?

(a) Midperipheral clearance facilitates tear exchange
(b) Too little clearance can lead to corneal oedema
(c) Too much clearance can lead to central corneal staining
(d) To attain more midperipheral clearance the central curve must be steepened

11. Regarding keratoconic fitting with corneoscleral lenses, which of the following statements is incorrect?

(a) The sag of the eye is much less predictable
(b) Topography information is generally very useful in first lens choice
(c) Many fitting sets are based on sag only, not base curve
(d) Some vault of the cornea is always desired

12. Regarding keratoconic fitting with the ClearKone lens, which of the following statements is incorrect?

(a) The vault increases by 50μm from one lens to the next
(b) For a given patient the overrefraction will be the same with any vault
(c) The curvature of the front surface of the lens is relatively steep, and this can result in increased aberrations
(d) The recommended lens of first choice is the 250 vault lens with the medium skirt

CPD Exercise

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Reflection

1. What impact has your learning had, or might it have, on:
   - your patients or other service users (eg those who refer patients to you, members of staff whom you supervise)?
   - yourself (improved knowledge, performance, confidence)?
   - your colleagues?

2. How might you assess/measure this impact?

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