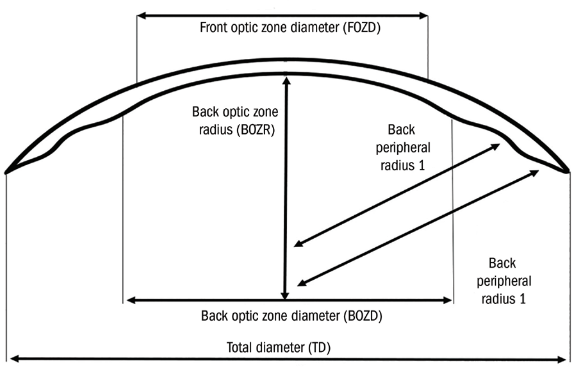
Essential contact lens practice

9 – Rigid gas permeable contact lens fitting

In the ninth article in our major series about modern contact lens practice edited by **Dr Rachel Hiscox**, **Dr Katharine Evans** discusses rigid gas permeable contact lens fitting (C76252, one distance learning CET point suitable for optometrists, contact lens opticians and dispensing opticians)

The increasing availability and power ranges of disposable soft contact lens designs has led to a steady decline in the popularity of rigid gas permeable (RGP) lenses. Despite many advantages over hydrogel lenses, an international survey of rigid lens fitting revealed that between the period of 2007 and 2011 only 10.8% of contact lens fits was with rigid lenses. In a 2019 UK contact lens prescribing survey detailing over 1,000 fits, compared to soft lenses, only 1% of new fits and 10% of refits were into RGPs. While the initial lens awareness and period of adaptation that comes with RGP lenses can be unappealing to patients, the stable lens surface of the RGP can provide superior visual quality compared to soft lenses. As a result of the tear lens (the thin layer of tears formed beneath the RGP) moderate amounts of corneal astigmatism and even irregular astigmatism can be effectively corrected. In patients with stable prescriptions, RGP lenses are also a cost-effective alternative to disposable soft lenses in full-time wearers. When compared to soft lenses RGPs tend to be fitted to older patients, with a greater proportion of bifocal or multifocal fits.[1] Despite poor levels of compliance in RGP wearers,[3] daily RGP contact lens wear is associated with the lowest risk of microbial keratitis.[4] Increased post-lens tear exchange with RGPs compared to soft lenses is thought to reduce exposure time to debris, toxins and antigens trapped behind the lens surface.[5]

FIGURE 1 Dimensions for a tri-curve spherical RGP



ESSENTIAL CONTACT LENS PRACTICE

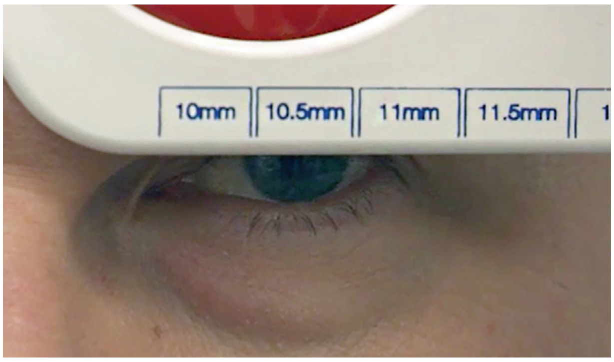
- Insights into contact lens wear
- Initial patient discussion
- Initial examination 1 – refraction and corneal assessment
- Initial examination 2 – slit lamp
- The tear film in contact lens wear
- Contact lens selection
- Soft contact lens fitting
- Soft toric contact lens fitting
- **Rigid contact lens fitting**
- Managing the presbyope
- Instruction and compliance
- The aftercare
- The future for contact lenses

Sophisticated lens design and manufacture mean a wealth of parameters, power range and lens designs are available. While using custom-made multi-curve lens designs increases the practitioner flexibility in dealing with a range of corneal contours, many spherical and aspheric 'system' lens designs can cover most eventualities. In a study of 22 neophytes fitted with RGPs, 73% successfully completed the one-month study period. Successful lens wearers achieved high levels of subjective vision and comfort within 10 days.[6] High levels of RGP fitting success have also been reported in larger scales studies.[7,8] While practitioners may be reluctant to fit RGP lenses, assuming more clinical skill and patient chair time is needed, the principles to select an initial lens and assess the fit are actually very straightforward. This article concentrates on basic procedures and techniques required to fit RGP contact lenses in routine practice.

LENS DESIGN

The back-surface design of RGP contact lenses may be spherical, toroidal, aspheric or a combination. Spherical lenses may be bi-curve, tri-curve or multi-curve designs, where each radius of curvature progressively increases to mimic corneal flattening. Figure 1 shows the design of a tri-curve spherical RGP. The radius of curvature of the back surface of the lens is known as the back →

FIGURE 2 Measurement of the horizontal visible iris diameter (HVID) with an adapted ruler



optic zone radius (BOZR) and the size of this optic is termed the back optic zone diameter (BOZD). The total diameter (TD) describes the overall size of the lens.

For an ideal or alignment fit, the back surface of the RGP will align with the anterior corneal surface. This ensures that pressure exerted on the cornea is evenly distributed across the whole area under the lens, limits the mechanical effect of the lens on the corneal surface, and minimises lens flexure, promoting lens comfort. In an alignment fit a thin layer of tear film (the tear lens) forms between the cornea and back surface of the lens. The periphery of the lens is designed to allow for edge clearance to facilitate tear exchange and lens removal. A lens with an alignment fit will allow for effective tear exchange to maintain normal corneal physiology. In the case of steep fitting lens pooling of the tear lens can cause stagnation whereas mechanical complications can occur in the case of corneal touch with a flat fitting lens.

Contemporary 'system' lenses have been designed and manufactured to ensure that the back surface is blended into one continuous, smooth surface and are designed to fit the majority of patients with typical corneal shape factors. RGP materials used today include silicone acrylates and fluorosilicone acrylates which offer good oxygen permeability, with the latter also benefitting from better wettability and fewer deposits.

INITIAL MEASUREMENTS

Besides the standard investigations undertaken prior to soft lens fitting as described in the previous chapters in this series, a small number of additional initial measurements are necessary to select the different parameters of the trial lens.

HORIZONTAL VISIBLE IRIS DIAMETER (HVID)

This is most easily recorded with an adapted ruler (figure 2) and informs the total diameter (TD) of the trial lens, which should be approximately 1.5 to 2mm smaller than the HVID.

VISIBLE PALPEBRAL APERTURE (VPA) AND LID POSITION

The VPA and lid position in relation to the limbus can be used to inform the TD, as a smaller palpebral aperture may benefit from a smaller TD. The upper eyelid position can affect the extent of lid attachment while centration may be affected if the lower lid lies significantly below the limbus. Consideration of the lid position can be particularly useful when troubleshooting a poorly centered lens.

PUPIL DIAMETER

Habitual and maximum pupil size, measured in a darkened room with the eye illuminated using the UV light on the Burton lamp, should be recorded. While the BOZD is typically pre-determined for a particular lens, it should ideally be at least 1.0mm larger than the maximum pupil size to avoid symptoms of flare.

ASSESSMENT OF CENTRAL CORNEAL CURVATURE

Central corneal curvature can be recorded with either a keratometer or corneal topographer. Central keratometry readings (K-readings) are used to determine the BOZR but also allow calculation of the extent of corneal astigmatism. As a rule of thumb, 0.05mm difference between the K-readings equates to 0.25DC corneal astigmatism. When fitting a spherical lens, the initial trial lens should be chosen using the manufacturer's recommendations for a specific lens design, which typically follow the guidance shown in table 1. For corneas with no or low levels of corneal astigmatism the suggested initial BOZR is that of the flattest K-reading. As the extent of corneal astigmatism increases the difference in the radius of curvature of the two corneal meridians increases. This results in increasing levels of clearance between the steeper corneal meridian and the back surface of the lens, which can have a detrimental impact on comfort and lens stability. The initial BOZR is therefore slightly steepened according to the magnitude of corneal astigmatism. However, this cannot be achieved with higher degrees of corneal astigmatism because of unstable fitting characteristics. In cases where corneal astigmatism exceeds levels of approximately 2.50DC a back surface toric RGP is required to achieve a satisfactory fit. It is recommended to follow the manufacturer's fitting guide when fitting an aspheric design, as the initial BOZR will be related to the degree of asphericity of the lens design.

When the K-readings are considered in relation to the refraction it is possible to determine the site and degree of any astigmatism whereby: Total ocular astigmatism = corneal astigmatism + lenticular astigmatism. Spherical lenses can correct moderate corneal astigmatism through neutralisation by the tear lens. If astigmatism is lenticular, a spherical RGP lens will have no effect on its correction and a front surface toric RGP will be required. Toric RGP fitting is discussed in greater detail later in this article.

TABLE 1 Choice of BOZR based on K-readings for spherical RGP lenses

Corneal astigmatism	Suggested Initial BOZR	Example K-readings	Calculated corneal astigmatism	Initial BOZR (mm)
Spherical – 0.75DC	Fit on flattest K-reading	7.80@180/7.75@90	0.25 DC	7.80
0.75 – 1.00 DC	Between 0.00 to 0.05 steeper than flattest K	7.80@180/7.60@90	1.00 DC	7.75
1.00 – 2.50 DC	Between 0.05 to 0.10 steeper than flattest K	7.80@180/7.35@90	2.25 DC	7.70
Over 2.50 DC	Back surface toric recommended	7.80@180/7.20@90	3.00 DC	Back surface toric recommended

FIGURE 3 **Fluorescein picture with overlaid central, mid-peripheral and edge zones, graded for fluorescein intensity on a +2 to −2 scale along the principal meridians according to the RGP Consensus Group.[11] On this scale +2 refers to areas of pooling where the fit is too steep, 0 is alignment and -2 refers to areas of touch where the fit is too flat.**

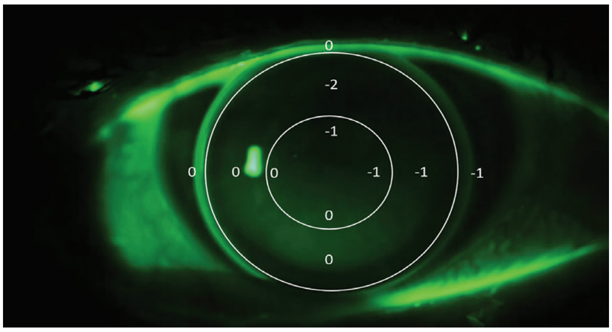
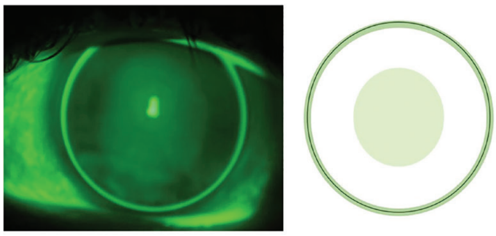


FIGURE 4 **An example fit record for a steep fit, shown in the slit lamp photograph. The fit record shows a drawing of the fluorescein fit, along with written notes, as described by the RGP Consensus group report.[11]**



No7, Quasar, 7.70/9.60/-2.00

Settling time: 20 mins

Centration: C

Movement on blink: -1

Coverage: Full in all positions of gaze

Comfort: 3/6

Fluorescein fit: CME
V: +1 -1 0
H: +1 -1 0

INITIAL LENS SELECTION

Lenses can be fitted either empirically, where the baseline data is supplied to the manufacturer, or with a diagnostic lens from a fitting set. When fitting 'system' lenses, practitioners typically only need to specify the BOZR, TD, back vertex power (BVP) and lens material. While some practitioners prefer the use of diagnostic lenses as it can reduce chair time, diagnostic sets typically only come in a single power. This can result in changes to the fit due to variation of power; the lens thickness, centre of gravity and even edge profile can vary between different lens powers. Therefore, myopes should be fitted with minus powered diagnostic lenses and hypermetropes with plus powered diagnostic lenses. While fitting lenses empirically has the advantage that patients get to appreciate the visual correction/quality it can lengthen the fitting process if the lens parameters need to be altered.

LENS APPLICATION AND INITIAL ADAPTATION

Where possible, new lenses should be hydrated in a soaking solution for at least 24 hours prior to lens application. While it remains contentious among practitioners, the use of topical anesthetic prior to lens application has been shown to improve initial comfort, reduce anxiety during adaptation,[9] improve overall satisfaction and reduce dropouts without increasing corneal staining in a placebo group.[10] The use of topical anaesthetic is also beneficial to reduce the initial reflex tearing response, which will aid in the fit assessment.

Immediately prior to lens application, patients should be instructed on the lens awareness sensation they are likely to experience. This experience can be likened to having an eyelash in the eye. Patients should be encouraged to look downwards to minimise the interaction of the lid on the lens edge and reduce the sensation of lens awareness. Assessment of the lens fit should not take place before reflex tearing has subsided as the lens will move excessively and fluorescein will be washed away too quickly. A group of over 100 experienced practitioners (known collectively as the GP Consensus Group) concluded an ideal initial adaptation period of at least 20 minutes.[11]

After initial adaptation, the patient should be tolerably aware of the lenses and any reflex lacrimation should have stopped. If the patient reports discomfort or a foreign body sensation, lifting the upper eyelid will enable the practitioner to judge whether or not any discomfort is due to normal adaptation (in which case it will disappear when the lid is lifted) or a foreign body trapped between the lids (in which case it will remain).

LENS FIT ASSESSMENT

The assessment of RGP lens fit involves the evaluation of both static and dynamic criteria. The dynamic fit should be assessed with the slit lamp using white light (ideally with a diffuser), low magnification and with sufficient illumination to aid observation but not too bright as to initiate lacrimation. Examination should include assessment of the following:

Dynamic assessment with low-medium magnification and diffuse white illumination

- **Centration**

Lens centration should be assessed in the primary position, with the relationship to and the interaction with the lids considered. Lenses may fit between the VPA, known as interpalpebral or show lid attachment, where the upper lid controls centration. Centration can be recorded using a fitting cross, or in combination with coverage as follows:[11]

C: Adequate centration
L: Lens crosses the limbus
P: Optic zone crosses the pupil in mesopic conditions

- **Movement on blink**

Lens movement on blink can be estimated by comparing the movement to a known slit beam height or to the lens TD. It can also be beneficial to record the speed and direction of movement immediately following a blink. The RGP consensus group[11] advised that movement could be recorded on a -2 to +2 scale as follows, where 0 represents ideal movement:

+2: > 2.0mm movement
+1: 1.6-2.0mm movement
0: 1.0-1.5mm movement
-1: 0.5-0.9mm movement
-2: < 0.5mm movement

- **Coverage**

Lens coverage should be assessed by instructing the patient to look in the four positions of gaze, with any lens crossing of the limbus recorded. Care should be taken to ensure appropriate initial adaptation has been allowed as reflex tearing can cause excessive lens movement and an inaccurate interpretation of lens fit.

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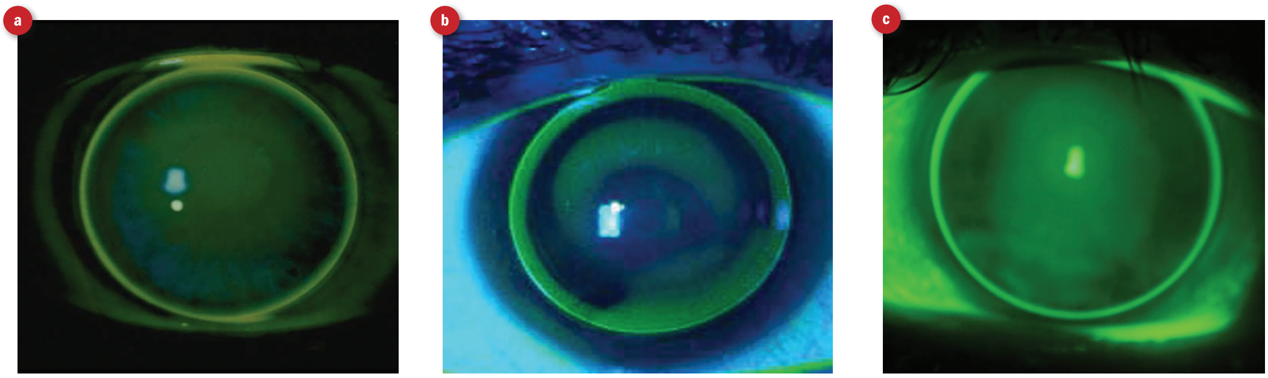
TABLE 2 Fitting characteristics of different RGP contact lens fits

Fitting characteristic		RGP Lens Fit		
		Flat	Alignment	Steep
Dynamic Fit	Centration	Typically, good centration in primary position	Good centration in primary position and blinking With lids held apart, lens should slowly decentre inferiorly	Typically, unstable, decentres inferiorly
	Movement on blink	Excessive movement on blink	1-1.5mm smooth vertical movement on blink	Limited or no movement on blink
	Coverage	Lens edge may cross limbus on excursions	Lens edge shouldn't cross limbus on excursions	Lens edge typically doesn't cross limbus on excursions
Fluorescein Fit	Centre	Central touch	Apical clearance	Central pooling, sometimes trapped bubbles of air causing dimple veiling
	Mid periphery	Mid peripheral pooling	Slight mid peripheral touch/alignment	Excessive mid peripheral touch
	Periphery	Excessive edge clearance (>0.5mm)	Narrow band edge clearance (0.4-0.5mm)	Very narrow band edge clearance (<0.4mm)
	Borders	Boundary between central touch and mid peripheral pooling may be well defined	Boundary between centre and mid periphery reasonably undefined	Boundary between central pooling and mid peripheral touch may be well defined
	Dissipation of NaFl	NaFl may dissipate quite quickly due to excessive tearing from uncomfortable lens	NaFl dissipates very quickly due to optimum tear exchange	NaFl remains trapped under lens for considerable time due to poor tear exchange
Comfort		Poor comfort due to excessive movement, adaptation severely compromised	Reasonable initial comfort, continually improves during adaptation	Typically, fairly good comfort initially due to limited lens movement
Vision		Inconsistent vision, due to excessive movement on blink	Clear and stable	Typically, fairly clear and stable
Over-refraction		Negative tear lens formed; plus over refraction	None/minimal over-refraction expected if correct power selected initially	Positive tear lens formed; negative over refraction
Amendment		Steepen lens by reducing BOZR or increasing TD	No amendments needed	Flatten lens by increasing BOZR or reducing TD

FIGURE 5 Fluorescein patterns for alignment (a), flat (b) and steep (c) fitting lenses (Images a and b courtesy of Bill Harvey)

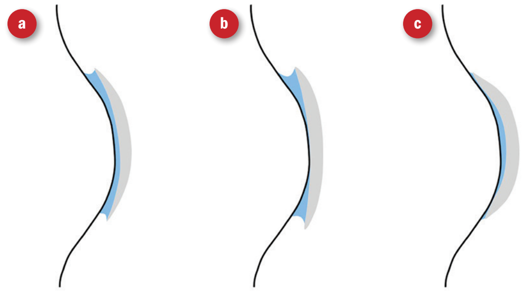


Static fluorescein fit assessment with low-medium magnification and cobalt blue illumination

Assessment of the static fit allows the practitioner to interpret how the back surface of the lens aligns with the cornea; fluorescein dye is used to aid visualisation of the tear lens. The fluorescein strip should be moistened with saline before being applied to the superior temporal bulbar conjunctiva to facilitate effective mixing with the tear lens and maximize retention on the ocular surface.[11] Following application, the optimum time to observe the fluorescein pattern has been shown to be between 30 seconds and three minutes.[12] The fluorescein pattern should be observed using a slit lamp with a cobalt blue filter in combination with a Wratten filter to enhance the contrast. Although a Burton lamp can also be used, many modern RGP materials contain a UV blocker, which will hinder fluorescence.

The fluorescein pattern is best evaluated when the lens is centred, which may require manipulation of the eyelids. Failure to re-centre the lens can lead to misinterpretation of the fluorescein pattern. The level of fluorescence is a function of the thickness of the tear lens. Therefore, areas of touch or minimal clearance will appear dark whereas areas of excessive clearance, showing pooling of the tear lens, will appear very bright. By assessing the change in intensity of the fluorescein across the lens, the distance between the posterior lens surface and the cornea can therefore be interpreted. The practitioner should systematically assess the fluorescein pattern in three regions: centre, mid-periphery and periphery. The GP Consensus Group suggest that the fluorescein pattern should be recorded in these three regions along the two

FIGURE 6 **Tear lens profiles for an aligned fit (a) that does not induce unwanted power, a flat fit (b) that forms a negative tear lens and a steep fit (c) that forms a positive tear lens**



principle meridians.[11] The Group also suggests using a five point scale to record fluorescein intensity where +2 indicates dense pooling, 0 indicates alignment and -2 indicates corneal touch (figure 3). Table 2 summarises the fitting characteristics for different lens fits. An example of a complete fit record is given in figure 4 and figure 5 shows the fluorescein pattern for three differently fitting lenses.

VISION ASSESSMENT AND OVER-REFRACTION

A spherical over-refraction is essential to determine if a change in the final lens power is necessary. For an alignment fit the visual acuity should be crisp and stable with a precise end-point of refraction. If a stable result cannot be obtained with spherical lenses, a cylindrical over-refraction should be attempted. A stable result indicates that residual (lenticular) astigmatism exists and that a toric lens may be required. For a lens that is fitted in alignment with the cornea the final lens power can be easily calculated as follows:

BVP = power of trial RGP lens + over-refraction

For example, the following lens is fitted; 8.0/9.6/-3.00

This indicates the BOZR is 8.0, the TD is 9.6 and the BVP is -3.00. An alignment fit is recorded with a +0.50DS over-refraction needed to optimise the visual acuity.

Therefore, the final lens specification will be 8.0/9.6/-2.50.

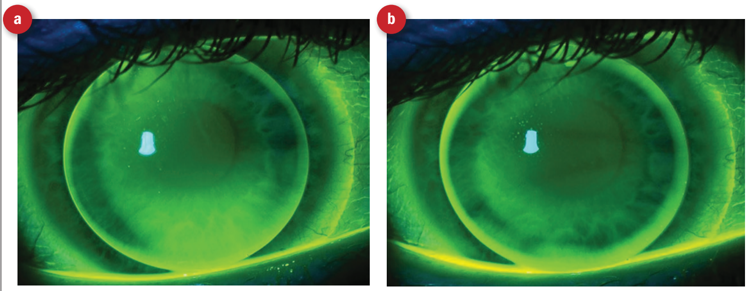
BVP = -3.00 + 0.50
BVP = -2.50DS

However, if the lens is not fitting on alignment, the tear lens will induce unwanted power (figure 6). If the lens is fitting steep, a positive tear lens will result and a negative over-refraction will be required. If the lens is fitting flat, a negative tear lens will result and a positive over-refraction will be required. Determining the power of the tear lens can also be useful to confirm the lens fit. As a general guide, the tear lens induces +0.25DS for every 0.05mm that the BOZR of the lens is steeper than the corneal radius. Conversely, the tear lens induces -0.25DS for every 0.05mm that the BOZR of the lens is flatter than the corneal radius. Therefore, considering a lens that is not fitted in alignment with the cornea the final lens power should be easily calculated as follows:

BVP = power of trial RGP lens + over-refraction + tear lens power

For example, the following lens is fitted (7.9/9.6/-3.00) and is determined to be 0.1mm too steep based on the fluorescein

FIGURE 7 **(a) Spherical RGP lens on a cornea with 3.00D with-the-rule astigmatism (steeper vertically). Note increased pooling and a wider band of edge clearance across the vertical meridian compared to the horizontal meridian.**
(b) Back surface toric contact lens on the same eye. Note the relatively consistent 360˚ edge lift and light fluorescence over the centre, indicating an alignment fit. (Images courtesy of David Ruston)



pattern, with a -0.50DS over-refraction needed to optimize the visual acuity. The steep lens induces a positive tear lens with a power of +0.50DS causing a negative over-refraction to compensate. The lens needs to be flattened by 0.1mm to correct the fit. Therefore, the final lens specification will be 8.0/9.6/-3.00.

BVP = -3.00 + 0.50 + -0.50
BVP = -3.00DS

INTERDEPENDENCY OF FITTING VARIABLES

Every variable in RGP lens design has an inter-dependency on other variables. If there is a need to change one parameter on the lens, such as BOZD, then, if the same fitting relationship is to be maintained, the BOZR also has to be altered to maintain the same sagittal height. The basic rules of thumb in making alterations to lens parameters to maintain equivalency are outlined below.

- An increase in BOZD/TD of 0.5mm will require a flattening of the BOZR by 0.05mm
- A decrease in BOZD/TD of 0.5mm will require a steepening of the BOZR by 0.05mm

TROUBLESHOOTING

Modern 'system' lenses are designed to fit the majority of patients. Undesirable patient symptoms or fitting characteristics can often be managed by modifying certain lens parameters, which are summarised in table 3 with a suggested remedy. Discomfort that persists past the initial adaptation period is typically associated with poor lens fit, excessive corneal astigmatism or even a trapped foreign body. While unstable vision is likely to be caused by a flat fitting lens, poor vision may be the result of incorrect lens power, residual astigmatism or even lens flexure. Decentration in any direction is typically an indication the lens is too flat. However, it may also be caused by corneal astigmatism; with-the-rule astigmatism typically causes vertical decentration whereas against-the-rule can cause lateral decentration. It is worth noting that most RGP lens manufacturer's provide invaluable technical support and can provide comprehensive advice when troubleshooting.

TORIC RGP FITTING

Toric RGP contact lenses are indicated if an adequate fit cannot be obtained with a spherical lens. Furthermore, a toric lens may be necessary to improve patient comfort or the quality of vision if there is a significant amount of residual (lenticular) astigmatism (typically >0.75 to 1.00DC). Table 4 shows examples to

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TABLE 3 Causes and management of common undesirable patient symptoms or fitting characteristics

Complaint	Possible cause	Management
Poor comfort	Excess movement	Tighten fit
	Excess edge clearance	Reduce edge clearance
	Edge too thick	Thinner edge
	Foreign body	Remove and replace lens
	Damaged lens edge	Replace lens
	Astigmatic cornea	Refit with toric lens
	Patient sensitivity	Increase TD
	Poor wetting	Change material
Poor vision	Refractive change	Refract and change power
	Corneal shape change	Assess fit and modify
	Residual astigmatism	Refit with toric lens
	Flexure	Refit with aspheric or toric lens
	Deposits	Clean lens, change material
	Heavy surface scratches	Replace lens
	Poor wetting	Remove and clean lens, replace if old, change material
Lens centering high, not dropping after blink	Excessive TD	Reduce TD
	Lens too thick	Reduce thickness
	With-the-rule astigmatism	Modify fit, consider aspheric or toric design
Lens decentering inferiorly	Lens too flat	Steepen fit
	Inadequate TD	Increase TD
	Lens too thick	Reduce thickness
Lens decentering laterally	Lens too flat	Steepen fit
	Inadequate TD	Increase TD
	Against the rule astigmatism	Modify fit, consider aspheric or toric design
Lens is stationary	Lens too steep	Flatten fit

demonstrate how the site of astigmatism affects the contact lens choice. A toric lens may be necessary to improve lens centration as lenses can decentre vertically in with-the-rule astigmatism and laterally in against-the-rule astigmatism. Furthermore, long-term issues with lens flexure or corneal moulding can also occur.

When fitting a toric cornea with a spherical lens the area of alignment is reduced. As the magnitude of corneal astigmatism increases, the area of alignment along the steeper corneal meridian reduces causing increased edge clearance and lid interaction. This can be visualised as a characteristic 'dumbbell' shaped fluorescein pattern (figure 7a). To aid interpretation of a spherical fit on a toric cornea, the practitioner should consider the fluorescein pattern along each of the principle meridians. Reducing the TD can be used to minimise the edge clearance in the steeper meridian although this can lead to issues with lens centration and/or comfort. If the peripheral cornea is more toric than the centre and the fit cannot be improved with reducing the TD then a peripheral toric lens design may be indicated. Alternatively, an aspheric lens design may offer an improved fit due to reduced levels of edge lift.

In cases of excessive corneal astigmatism, typically >2.50DC, it is often necessary to fit a back surface toric lens. This allows the back surface of the lens radii to align with the principle meridians forming a spherical tear lens fluorescein pattern (figure 7b). This results in more equal distribution of the lens over the toroidal cornea, improved centration and lens stability as well as subjective comfort. With a closely aligned fit, lens rotation is minimal so the incorporation of additional prism stablisation is not required. A back surface toric lens is also beneficial in cases where the cornea is toric but ocular refraction is spherical. The formation of a spherical tear lens ensures the compensation of the corneal astigmatism by the lenticular astigmatism is not interrupted.

Most lens designs are bitorics, where a compensating toric is added to the front surface. In patients where residual (lenticular) astigmatism limits the quality of vision, a front surface toric is necessary. Due to the spherical back surface of the lens stabilisation is required; typically, a prism ballast is utilised. While toric fitting sets are available, empirical fitting is more practical and is likely to reduce chair time. Baseline measurements, including the spectacle prescription, BVD and K readings should be supplied to the lens manufacturer.

SCLERAL, MINI-SCLERAL AND HYBRID LENSES

Hybrid lenses consist of a central rigid lens, bonded to a peripheral hydrogel or silicone hydrogel skirt with the aim of providing the visual performance of an RGP with the stability and comfort of a soft lens. While the initial hybrid lenses, introduced over 30 years ago, had issues with durability and fitting, modern designs benefit from superior manufacturing techniques and bonding technology. Scleral contact lenses are large diameter RGP lenses. The Scleral Lens Education Society specify mini-sclerals as lenses up to 6mm larger than the HVID and large-sclerals as lenses greater than 6mm larger than the HVID.[13] The lens rests entirely on the sclera, allowing the cornea to be vaulted. While scleral

TABLE 4 Examples to show how the site of astigmatism affects the contact lens choice. (Note that the residual astigmatism is calculated as the difference between the ocular astigmatism and the corneal astigmatism)

Ocular refraction	K – reading	Corneal astigmatism (DC)	Residual (lenticular) astigmatism (DC)	Site of astigmatism	CL options
-3.00DS	8.00@180/8.00@90	0.00	0.00	None	Spherical RGP, spherical soft
-3.00DS/ -1.50DCx180	8.00@180/7.70@90	-1.50	0.00	Corneal	Spherical RGP, soft toric
-3.00DS/ -1.50DCx180	8.00@180/8.00@90	0.00	-1.50	Lenticular	Front surface toric RGP, soft toric
-3.00DS	8.00@180/7.70@90	-1.50	+1.50	Mixed	Back surface toric, spherical soft
-3.00DS/ - 2.00DCx180	8.00@180/7.80@90	-1.00	-1.00	Mixed	Bi-toric or front surface toric RGP, soft toric
-3.00DS/ -3.00DCx180	8.00@180/7.40@90	-3.00	0.00	Corneal	Bi-toric RGP, soft toric

lenses are therefore ideal for irregular corneas, they are also used to correct ametropia and for the management of ocular surface disease. The popularity of these 'specialist lenses' is growing due to developments in high Dk lens materials, lens designs and advanced lens manufacturing processes. Advances in ocular imaging technology, such as corneal topography and anterior segment optical coherence tomography (OCT) have also aided fitting. Mini-sclerals in particular have gained popularity as they are often thinner than large-sclerals, typically require less corneal clearance and can be easier to fit by avoiding the asymmetry of the more peripheral sclera.[13] In a cross-over study to assess the objective and subjective performance of mini-scleral lenses in astigmatic participants, 75% preferred the vision with the mini-scleral lens compared to a soft toric.[14] Furthermore, there were no significant differences in wearing time and subjective comfort between the two lens types.

KEY POINTS

1. RGP lenses can be a practical option for many patients, particularly those with more complex prescription requirements.
2. If indicated for a new patient, always fit an RGP first – it is easier to move from RGP lenses to soft than vice versa.
3. Use of an anaesthetic during the initial fitting can aid fit assessment by reducing reflex tearing.
4. Reflex tearing can be reduced and comfort increased by asking the patient to adopt a downward gaze while the lens is settling.
5. If making a change to the TD/BOZD, be sure to compensate for the change by adjusting the BOZR appropriately.

CONCLUSIONS

Practitioners should keep an open mind to the merits of RGP lenses. It is important to counsel prospective RGP wearers about the benefits of RGPs but also give realistic advice about the fitting and adaptation process. A systematic approach to lens selection and fitting is important and support from technical services, where necessary, is crucial for success.

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• This article is part of a revised and updated 'Essential Contact Lens Practice' series, originally authored by Jane Veys, John Meyler and Ian Davies. This article was produced without further input or review from the original authors.

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