Contact lens correction for presbyopia

A simple approach to fitting

Over the last 10 years, presbyopic correction has become an ever-bigger part of contact lens practice, with over 25% of contact lens patients being presbyopic. There are two major factors involved in this process. Firstly, patients fitted with contact lenses at a young age, say 20 to 30 years ago, are now presbyopic and have no wish to revert to spectacles of any sort. Secondly, the general population is ageing and living longer.

Children born shortly after the Second World War (bulge babies) are now well into presbyopia – their children are grown up, they are well off and willing to spend money on self-pampering. They like to spend money on technology, their grandchildren and holidays. Our job is to offer them a wide variety of optical products. It simply isn’t good enough to say that presbyopic correction with contact lenses is too expensive or too much bother. The wise practitioner can charge high fees for their time and a sensible margin on the final contact lenses.

This article looks at the options for presbyopia that we can offer as contact lens practitioners and fitters, and provides a simple approach to fitting.

Attracting patients

There are two common approaches to promotion in High Street practice – the negative approach and the pro-active approach.

Practitioners who take a negative approach:

- Never suggest that there are any contact lenses for older people
- Insist that the only way to correct presbyopia is with reading spectacles
- Tell the story of the airliner that crashed in California because the pilot was wearing monovision
- Take patients out of contact lenses and sell them modern multifocal spectacles
- Never suggest that there are any contact lenses

Those who take a negative approach to contact lenses, and in particular to presbyopic correction, are missing a great opportunity for themselves and their patients. One of the greatest bifocal contact lens pioneers of the last 60 years, John de Carle, once said, “I am happy that bifocals are not fitted in the High Street because more patients will come to see specialist practitioners like me”. It is one of his patents that is used in the Johnson & Johnson Vision Care Acuvue® Bifocal contact lens.

Options for presbyopes in RGPs and soft lenses

There are several options for presbyopic patients:

1. Distance contact lenses and reading spectacles
2. Full monovision contact lenses where the full addition is put on the non-dominant eye
3. Partial monovision contact lenses, where two-thirds of the near vision addition is put onto the non-dominant eye
4. Near vision contact lenses and top-up distance spectacles
5. Multifocal contact lenses (simultaneous) and top-up readers
6. Modified multifocal contact lenses, with
the non-dominant eye over-corrected.
7. Enhanced monovision contact lenses. With the dominant eye, single vision distance plus a non-dominant multifocal contact lens; or occasionally, a near single vision contact lens with a multifocal lens in the dominant eye.
8. Different multifocal designs in each eye – usually, distance centre in the dominant eye and a near centre in the non-dominant eye.
9. Alternating bifocal contact lenses.

Practitioners who fit contact lenses for presbyopia know that you often have to try several options. However, the two most popular options on both visual and cost grounds are (1) and (2). Single vision contact lenses are by far the easiest to fit, give good clear vision in all positions of gaze and are also the cheapest option for the patient.

1. Distance CLs with reading spectacles
In the early stages of presbyopia, near correction is only required when the patient is tired or looking at particularly small print in poor light. A pair of +0.75 readers may be all that is required to help on these occasions. There seems little point in advancing further at this stage if the patient is happy to have a pair in their pocket.

2. Monovision (Figure 1)
For most presbyopic patients, a touch of over-correction on the non-dominant eye will suffice for a couple of years. Then, of course, top-up reading glasses will need uneven additions, so readymade readers will not be accurate. As presbyopia advances, the contact lens practitioner will over-plus the non-dominant eye for several years. However, some patients will not tolerate monovision for long and start to complain that they don’t like the distance being blurred in one eye. Two options are then available – either move on to multifocal contact lenses or partial monovision.

3. Partial monovision
It is sometimes possible to continue a patient with partial near vision correction in the non-dominant eye for a few years, using additional top-up distance spectacles and top-up readers when needed for accurate vision. However, this stage won’t last much beyond the age of 55.

4. Near vision CLs and distance vision spectacles
Bilateral correction for reading and top-up distance spectacles can be considered, particularly for office workers. This is particularly useful on patients with high negative corrections. High myopes often don’t mind being -1.50D under-corrected or more. As long as they can see with their -1.00s, they don’t really need -12.50. Such patients, as well as having a pair of -1.50 spectacles for driving and the theatre, will often have a second pair of distance-only contact lenses for weekends.

5 & 6. Multifocal contact lenses: soft options
Patients seeking contact lens correction for the very first time should be approached differently from existing contact lens wearers. This is usually because they want to pay their money and have a ‘quick fix’. Soft lenses are the first option if the prescription is reasonably spherical. The ideal patient is the +2.00 hyperope with a +1.50 addition who is struggling not to wear spectacles all the time. All you have to do is improve the blur.

Options available in soft are usually aspheric in design with a distance centre and near periphery (Figure 2a). However, there are two other popular alternatives: near centre concentric lenses with a distance periphery (Figure 2b): or the concentric rings of distance and reading (Acuvue Bifocals) (Figure 4b).

Disposable soft lenses manufacturers can provide professional samples, so start with a one-day disposable multifocal lens, such as CIBA Dailies Progressive, with the non-dominant eye over-plussed by 0.50 and gauge vision. Assess visual acuity after two minutes. Explain the benefit of one-day lenses and then suggest seeing what else can help. Put in a pair of monthly multifocals of similar design to the one-day lenses and re-assess visual acuity. Put in a pair of simultaneous ring lenses, such as Acuvue Bifocals, and assess again.

In all cases, it is useful to use ±0.25, and ±0.50 flippers for binocular over-refraction, as well as individually checking both distance and near binocular visual acuities in both eyes. Show patients how making near better has a bad effect on distance, and vice versa. Some patients are quite happy with 6/9 and N8, while others demand 6/6 and N5. Remember, what is rated as successful with one patient can be a total disaster for another.

If all these options fail to give satisfactory distance vision, or the patient is unwilling to have top-up readers to help out, then consider enhanced monovision.

7. Enhanced monovision: soft option
Consider a combination called enhanced monovision. In this case, you have to decide which you want to enhance –
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Select from the appropriate prefix:
01- or 02- for optometrist
D- for dispensing optician
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You must use the correct prefix selected using the pull-down menu.

GOC/Irish Board Number
Surname
Password
Login

* You need a password to log in. If this is the first time you are attempting to log in you may not have a password. Enter your GOC number and initials above, leave the password blank and then click on the "Log In" button.

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These are rarely used in RGP designs because aspherics have taken over (see later). However, Figure 2b shows the design of the soft Simuvue bifocal (once called Alges). This lens has a 2.35mm or 2.55mm clear cut near centre surrounded by distance, the distance dominates. This segment sits slightly off centre in the patient’s pupil, occupying approximately 33% of the total area. The patient sees distance vision and near vision. As the pupil constricts with reading, the near portion dominates and as it opens with distance, the distance dominates. This is easily observed within the retinoscopic reflex. Some designs confuse the obvious effect of pupil diameter with accommodation and put it the other way round, often with an intermediate ring to reduce the effect of pupil size (Figure 3a).

Similarly, in the past, diffractive bifocals (Figure 4a) called Diffrax® were used for RGP’s, and Echelon® for soft lenses. Due to manufacturing costs, both these lenses were discontinued.
9. Alternating or ‘true’ bifocals: RGP options

Patients require RGP alternating vision bifocals (Figures 5a and 5b) when their eyesight cannot be corrected by spherical soft lenses, or when high additions preclude successful monovision correction.

A ‘true’ bifocal is one which alternates and gives the patient 100% distance and 100% reading (Figures 5, 6 and 7). At best, simultaneous lenses give 50% of the light to reading and 50% to distance. However, an alternating lens will only give near vision on downward gaze and unlike spectacles, when looking straight ahead, the near focus drops out of line with the pupil so that the patient has 100% view up and down. It is only if the patient looks down that the reading moves into view. This is a very important point because it means the patient can avoid tripping up steps like bifocal spectacle wearers.

However, to balance the equation, if the patient blinks very heavily, the lenses can be pulled upwards so that the reading obliterates the distance; this is not good when driving. So skillful fitting is required to make them work well.

The most popular lens of this type is the Tangent Streak Bifocal (Figure 5a) (No 7 Contact Lens Laboratory). There are other options, such as the Presbylite one-piece bifocal (Scotlens). A fused segment design called the Paragon ST (Straight Top) bifocal was a great success but due to manufacturing problems, the blanks are no longer made (Figure 5b). Serious fitters are hoping it will come back.

**Fitting process**

The Tangent Streak is a one-piece bifocal akin to the executive spectacle bifocal. The Presbylite has a triangular shaped solid segment. The lenses are prism ballasted and truncated, having moderate Dks. They all have ‘jump’ free or near monocentric optics.

Successful fitting of these lenses generally involves attaining inferior centration and minimal movement on blink, with rapid recovery post blink. For a 3mm pupil, at least 1.5mm of vertical movement is required to ensure satisfactory near vision, assuming 80% coverage of the pupil. However, the lower lid has been shown to only move upwards by about 0.8mm on downgaze. Thus, it is the upper lid which produces the majority of lens translation. The lower lid has to retain the lens, preventing it from slipping behind and thereby not translating. A truncated lens will align with the lower lid margin restricting rotation and aiding translation.

The prism ballast functions by virtue of what is termed ‘the watermelon seed principle’ (Figure 5b). This means that the upper lid squeezes the lens so that the base of the prism lies inferiorly, with the thinnest portion of the lens at the top. This effect occurs even when the wearer is upside down and thus gravity has little effect on the prism orientation. The truncation helps retain the lens on the lower lid and reduces the vertical lens diameter, and so increases the distance from the upper limbus to the lens edge. The possibility that at least 2mm of translation will occur is thus increased. Successful fitting and problem solving are usually helped by appreciating the ways in which the upper lid/lens and lower lid/lens interactions can be modified.

A near horizontal segment line is required, although perfection is less important than for spectacles, particularly for nasal rotation. In this case, the natural convergence of the eyes at near helps offset the rotation (Figure 6). The lid position and tension are crucial in supporting the lens mass, therefore truncations should be avoided with patients with low lower or flaccid lids.

**Empirically fitting alternators**

The keratometry readings are taken and the back optic zone radius (BOZR) selected to give alignment over the back optic zone diameter (BOZD). This will typically mean that a radius 0.10mm flatter than mean ‘k’ is selected. The distance from the lower lid to the inferior limbus is measured and a lens diameter selected according to the positions shown in Table 1. This means that the vertical diameter will be at least

<table>
<thead>
<tr>
<th>Lower lid position</th>
<th>HVID</th>
<th>Total diameter</th>
<th>Distance lower lid to visual axis</th>
<th>Segment height</th>
</tr>
</thead>
<tbody>
<tr>
<td>1mm above</td>
<td>11.0</td>
<td>8.40/8.00</td>
<td>4.50</td>
<td>3.20</td>
</tr>
<tr>
<td>lower limbus</td>
<td>11.5</td>
<td>8.90/8.50</td>
<td>4.75</td>
<td>3.45</td>
</tr>
<tr>
<td>0.5mm above</td>
<td>11.0</td>
<td>8.90/8.50</td>
<td>5.00</td>
<td>3.70</td>
</tr>
<tr>
<td>lower limbus</td>
<td>11.5</td>
<td>9.40/9.00</td>
<td>5.25</td>
<td>3.95</td>
</tr>
<tr>
<td>On lower</td>
<td>11.0</td>
<td>9.40/9.00</td>
<td>5.50</td>
<td>4.20</td>
</tr>
<tr>
<td>lower limbus</td>
<td>11.5</td>
<td>9.90/9.50</td>
<td>5.75</td>
<td>4.45</td>
</tr>
<tr>
<td>0.5mm below</td>
<td>11.0</td>
<td>9.30/9.10</td>
<td>6.00</td>
<td>4.40</td>
</tr>
<tr>
<td>lower limbus</td>
<td>11.5</td>
<td>9.80/9.60</td>
<td>6.25</td>
<td>4.65</td>
</tr>
<tr>
<td>1mm below</td>
<td>11.0</td>
<td>9.50/9.30</td>
<td>6.50</td>
<td>4.50</td>
</tr>
<tr>
<td>lower limbus</td>
<td>11.5</td>
<td>9.90/9.70</td>
<td>6.75</td>
<td>4.75</td>
</tr>
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</table>

Choosing the segment height empirically
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N.F. Burnett Hodd BSc, FCOptom, DipCLP

2mm smaller than the distance from the lower lid to superior limbus in order to permit sufficient translation. To determine the segment height, measure the distance from the visual axis to the lower lid in the primary position. Subtracting 1.3-1.5mm determines the segment height to order, as illustrated in Table 1; this is done by holding a pen torch about 50cm in front of the eye and measuring from the light reflex to the lower lid margin while the patient looks at the light. Obviously, it is important that the patient is relaxed and not closing up the lid due to apprehension. A slit lamp graticule may improve accuracy.

If the lower lid is below the lower limbus so that there is visible sclera, then a slightly larger lens should be used with a greater segment height. As a rough rule of thumb, more than 1mm of visible sclera will make upwards movement of the lens on downgaze limited, and the increase in segment height required may introduce a problem of flare. For visible sclera of 0.5mm and 1.0mm below the iris, the vertical lens size should be increased by 0.1mm and 0.2mm respectively. This is best achieved by ordering less truncation (typically 0.2mm rather than 0.4mm) as more can always be added later. The segment height should also be increased by 0.2mm and 0.3mm respectively to position the segment line effectively 0.1mm and 0.2mm higher, allowing for the extra lens diameter. This is also illustrated in Table 1.

Whilst it is possible to order a final lens without assessing a trial lens, this is not ideal due to the different variables and their effect on fitting. So if possible, a lens should be selected from a fitting set and assessed on each eye for final fit and likely visual performance. The patient also appreciates getting to feel a lens and to see translation in action. Tangent Streak lenses are available in a lower range +12.00 to -20.00, and additions of +0.75 to +3.50. Standard fitting sets have 20 lenses and lenses can be borrowed. Finally, an addition should be ordered 0.50 less than the spectacle addition because the effect of the prismatic correction is to increase the effective add of the final lens.

To comply with Department of Health recommendations on Prions, the trial lenses should not be dried after use, but should be soaked in sodium hyperchlorite for two hours then washed, dried and returned to the fitting set.

Fitting problems

High index lenses are totally unsatisfactory. They may occur if the fitting is too flat and the push-up test should be used to ensure that there is no accurate movement as the lens falls. Thinning the upper lens edge will reduce the tendency of the lid to lift the lens, as will increasing the amount of prism ballast. In the latter scenario, this may result in the lens lifting with the lid and then dropping rapidly after the blink, producing discomfort. When this occurs, fitting should be abandoned, assuming that the practitioner has tried to thin the upper edge.

If the patient has a narrow palpebral aperture, then a high riding lens may be improved by reducing the lens diameter to reduce the lens/lid interaction. The same approaches described above may be successful when the lens centres correctly (i.e. inferiorly) but is lifted excessively by the upper lid on blinking.

Rotation of the lens can indicate poor fitting. Nasal rotation may be associated with a steep fit and temporal with a flat fit. Where the fitting is aligned, then inclining the prism base in the direction of the swing will often resolve the problem. For example, where the segment persistently rotates 10° nasally in the right eye then ordering the prism base at 280° would be indicated.

Lack of translation on downgaze can arise where the fitting is too tight, or where the lower lid is unsuitable for the modality by being two flaccid or low relative to the lower limbus. An incorrectly finished truncation can encourage this if the inferior lens edge is thinned down.

As stated earlier, these lenses are bulkier than equivalent single vision lenses and therefore discomfort can be an issue in sensitive patients. However, before rejecting the lenses, ensure that the upper lens edge has been thinned and the truncation properly finished.

Visual problems which may arise include constantly poor distance acuity. Careful over-refraction is indicated to rule out residual astigmatism. This cannot be corrected with these lenses, except by the use of toric back surfaces. Obviously, under or over-correction can be sought and compensated for by re-ordering the lens. If the observation is flare, then the pupil size should be examined and the location of the segment line in relation to the inferior pupil border established. If more than 20% of the pupil is covered in the primary position, then flare is likely to result.

Where the patient complains of fluctuating vision, the lens should be examined for excessive movement and a segment top position which is too high. Where near vision is constantly poor, then the segment position in downgaze should be established. This may reveal lack of translation or rotation. The latter may also give rise to the symptom of reduced near vision on lateral gaze. It is generally better to ensure that the segment is more level on reading than in the primary position. Where there is variation in acuity with the blink, it is worth checking for greasing below the edges of segment line, which is a part of the lens that is more difficult to clean. Additionally, excessive movement may be responsible.

Given the potentially excellent visual results, alternating vision RGP bifocals should be part of every contact lens practitioner’s armoury. However, they may be best reserved as lenses for those presbyopes requiring at least a +1.50 addition with mainly near vision on downgaze requirements. Existing GP wearers tend to be better candidates than neophytes or soft lens wearers.

There is a general rule with RGP bifocal fitting: if the patient has small pupils and well aligned lids, then use an alternating design, or if the patient has large pupils and a poor Styles Crawford effect, use simultaneous vision.

It is worth noting that a soft version of the Tangent Streak, designed by Don Ezekiel in Perth, Australia, called the Triton (Figure 7), has been featured in OT (42: 10: 34-35).

Multifocal: RGP options

Many patients have worn RGPs for years and as they become presbyopic, they do not wish to wear reading spectacles. Furthermore, they get excellent vision with their RGPs and do not tolerate a switch to soft lenses even with modern torics. So you need to capitalise on their RGP enthusiasm and try all multifocal RGP designs. These vary from front and back surface aspheric designs (Figure 2) to concentric designs (Figure 3). Occasionally, the manufacturer will use a combination of front and back surface aspherics and almost all designs are central near (Figure 2b). Simultaneous concentric lenses can be either distance vision or near vision centres and often rely on a degree of alternation to work. A near vision centre is preferable as the pupils constrict on accommodating in good light so the reading becomes more dominant in the pupil area. Also, near centre simultaneous lenses work well where the pupil is naturally large. The reading portion fills one-third of the pupil area. For these to work well with small pupils, a degree of alternation needs to take place. Usually, the patient will get satisfactory near and distance vision in all positions of gaze.

Options in simultaneous RGP lenses

Fundamentally, the optical surfaces which produce the bifocal or multifocal effect can be spherical or aspheric. The surfaces involved in the optical modulation can be anterior, posterior or both.

Concentric segments are based on spherical lens geometry. The lens may have a circular central near or distance segment surrounded by a zone of the other power making up the rest of the BOZD (Figures 3a and 3b). These are rarely used nowadays but when they are they often work more by alternating than by other means, e.g. the Menicon Menifocal (Menicon) and SAM multifocal (CLPL UltraVision).

Aspheric bifocals have a mathematically derived form which changes from near to far correction (or vice versa) within the optical zone of the lens. Sophisticated geometries are available which help alter ocular aberrations (Figures 2a and 2b).

Table 1

<table>
<thead>
<tr>
<th>Segment Height</th>
<th>Degree of Translation</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1mm</td>
<td>10%</td>
</tr>
<tr>
<td>0.2mm</td>
<td>20%</td>
</tr>
<tr>
<td>0.3mm</td>
<td>30%</td>
</tr>
<tr>
<td>0.4mm</td>
<td>40%</td>
</tr>
</tbody>
</table>

Figure 1

Figure 2

Figure 2a

Figure 2b

Figure 3

Figure 7
Whilst giving rise to potentially greater visual compromise due to contrast loss, simultaneous vision lenses are of value in early to mid presbyopia, and where rigid segment lenses are unsuitable due to poor lower lid tone or position, or where there is excessive lens-lid interaction.

Whatever the degree of sophistication, there is a variation of the visual effect depending on the pupil size. If we fit a centre near type lens, then in low illumination distance vision is favoured. In high illumination near vision is enhanced, therefore drivers should wear sunglasses. If fitting centre distance lenses, then low illumination favours near vision and high illumination favours distance vision. In addition, there is the advantage of some translation during inferior gaze, which will benefit near vision. Obviously, sunglasses may need to be worn to read on the beach.

**Simultaneous vision bifocals: aspheric**

Lenses can be either back surface aspheric (prolate elliptical curve with eccentricity, $e < 1$), producing a centre distance lens, or front surface aspheric, producing either a centre near ($e > 0.6$) or centre distance (oblate ellipse, $e < 0$) lens. Practically all proprietary designs sold in the UK are back surface centre distance aspherics. Most offer a standard fixed aspheric geometry irrespective of the refractive error of the patient, although there may be several different additions. The customised designs offer an aspheric geometry for the individual patient.

**Simultaneous vision bifocals: advantages**

The visual effect is not as gaze dependant as with alternators, making them ideal for computer users. They have similar comfort and physiological tolerance as single vision lenses. The optical effect is multifocal, again ideal for computer users. They are less suitable for small pupils unless translation occurs. Arguably, they are best employed when the pupil diameter is 3-4mm or greater, as is typical in early to mid presbyopia. The pupil of an average 55-year old varies from about 5.5mm in the dark to about 3.25mm in normal room illumination, so most patients are suitable.

There is generally no image jump. Fitting is usually more straightforward than alternating lenses. By considering the ocular aberrations and employing a customised design facility, it is possible to meet or exceed the success rates associated with monovision. Stereopsis will generally be much better than with monovision.

**Simultaneous vision bifocals: disadvantages**

Good centration is said to be crucial to the success of simultaneous designs, but this may not always be achievable. Much smaller than average pupil sizes make this technique less suitable. A reduction in the contrast sensitivity due to superimposed retinal images will always occur. This may not lead to a reduction in the measured high contrast Snellen acuity. The visual compromise can be difficult for some patients and the addition effect can be pupil size dependant. For advanced presbyopes, top-up spectacles may be required, although only for certain tasks. To obviate the need for spectacles, some of the more sophisticated back surface aspheric designs enable some of the addition to be placed on the front surface. However, where near acuity is the sole concern, translating bifocals give a better potential result when the addition is high. Modified monovision type fitting improves success. Depending on the design, there may be less practitioner control over lens parameters, and back surface toric geometries are not widely available in back surface aspheric designs.

A relative disadvantage is the spectacle blur which occurs with some aspheric back surface bifocals when a significant addition is incorporated in the back surface profile (>1.50D). In these cases, hyperopic orthokeratology can occur where the spectacle refraction on lens removal shifts as much as +1.00D. Thus, the low hyperope finds they can see well without their spectacles, whereas the myope finds their distance vision blurred. Full-time RGP wearers are not troubled by these reversible changes to corneal refractive power, but part-time wearers are, and therefore this must be considered at the outset when selecting and advising patients.

**Appearance of simultaneous vision aspheric RGP multifocals**

Where the addition is worked on the front surface, the lens fit should be normal alignment – although the diameter may be a little larger than normal. Back surface aspherics should show some degree of apical tear pooling that reduces down to mid-parallel alignment and a normal, or slightly greater than normal, edge clearance band. A typical appearance of a Quasar Plus (No 7 Contact Lens Laboratory) back surface aspheric is shown in Figure 8a next to a standard Quasar single vision lens (Figure 8b).

**Mechanism of simultaneous vision aspheric RGPsw**

With all aspheric lenses, centration is vitally important to achieving the theoretical visual effect. This cannot be overstated. If centration is not good, then induced astigmatic aberation will arise, reducing visual acuity. Figure 9 shows the effect of decentering a hyperbolic surface on the induced cylinder and sphere.

Those lenses having fixed back surface aspheric geometries rely on the aspheric curve being more positively powered away from the optical centre. Over the pupil zone, there is a power gradient and additionally, any vertical movement of the
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aspheric RGP multifocals

Some basic key points to observe are as follows:

- Good centration is vital to the success of all aspheric lenses. This makes good thickness control and edge finish vital. Centration can be improved by using large diameters, whilst allowing a difference between lens total diameter and horizontal visible iris diameter (HVID) of at least 1.5mm to allow for some movement. Good centration can be impossible to achieve on corneas with significant (>1.5D) against-the-rule astigmatism. In these cases, toric alternating vision or monovision is a better option. Additionally, the cornea with high degrees of with-the-rule astigmatism, there may be a tendency for the lens to adopt a high riding position.

- In general, any aspheric trial lens used must have a binocular vision power close to the ideal lens. However, in most cases, the manufacturer sends a lens of appropriate power to the practitioner.

- It is wise to avoid the use of phoropters in the over-refraction of patients wearing simultaneous vision aspheric lenses to correct presbyopia because of the effect on pupil size.

- At the outset, decide on whether good distance vision or good near vision is the requirement. If good distance vision is required, use a full distance vision corrected bifocal in both eyes. If good near vision is required, use a relative under-correction in both eyes.

- For most patients, the best compromise is modified monovision. This is a full distance correction with a lower addition bifocal in the dominant eye and an under-correction with the full addition in the other.

- Always allow adaptation/settling to occur before performing an over-refraction. It is worthwhile using a topical anaesthetic in a new wearer to reduce reflex tearing. This will make assessment of lens fit easier as well as measuring the visual result.

Empirically fitting aspheric RGP multifocals

In general, laboratories will expect the practitioner to supply:

- **K readings**: It is wise to avoid those patients with more than 2.50D of with-the-rule corneal astigmatism and >1.50D of against-the-rule corneal astigmatism.

- **HVID**: The lens should be at least 1.5mm smaller than this.

- **Refractive error and binocular vision diameter**: Ideally the design should be optimised for this.

- **Addition**: If this is >1.50D it may be wise to use a modified monovision fitting approach.

Fitting problems

No lens design offers the ultimate correction of the presbyopic eye. The most important key learning for the practitioner is not only to use a quality design, but also to act on feedback from the patient. Simply listening to the patient and acting on their feedback will make a huge difference in RGP bifocal fitting success. Some of the more common fitting problems and symptoms which occur with RGP simultaneous bifocals are listed in Table 2.

Patient selection

Contact lens practitioners need to consider several features of the patient:

- **History**: It would be foolhardy to attempt to fit a successful soft contact lens wearer with an RGP bifocal, and equally foolish to move a happy RGP wearer into soft contact lenses. Well-motivated new patients take surprisingly well to RGP bifocals.

- **Distance refraction**: Success is generally lower with patients with very good uncorrected vision. It is generally better to look for uncorrected vision of 6/12 or worse. Given that all contact lens systems for presbyopia correction impact to a greater or lesser extent on quality of distance vision, it follows that those patients who are accustomed to relatively good uncorrected vision may be less able to cope with the relative impairment in their distance vision. However, this should only be seen as a relative contra-indication, and a well-motivated patient can be very successful with RGP aspheric lenses.

Table 2

<table>
<thead>
<tr>
<th>Observation</th>
<th>Consequence</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor centration (lens optical centre &gt;1mm from pupil centre) and high riding</td>
<td>Poor distance vision - more negative power required than expected. Distance vision improves momentarily on blink. Good near vision</td>
<td>Increase diameter. Ensure fit not too flat. If &gt;2.50D with-the-rule astigmatism and increasing total diameter does not improve centration, use a back surface toric. Try prism ballast</td>
</tr>
<tr>
<td>Poor centration and riding horizontally off centre</td>
<td>Poor distance vision. Possibly poor near vision</td>
<td>Increase diameter. Avoid against-the-rule astigmatism &gt;1.50D. Use a toric</td>
</tr>
<tr>
<td>Poor centration and low riding</td>
<td>Poor distance vision. Distance vision improves momentarily on blink. Good near vision</td>
<td>Increase diameter. Ensure fit not too steep. If &gt;2.50D with-the-rule astigmatism and increasing total diameter does not improve centration, use a back surface toric lens. Order negative carrier</td>
</tr>
<tr>
<td>Poor distance vision with good centration</td>
<td>Over-refraction – prescribe minimum minus. Reduce add in dominant eye. Increase zone over which add is worked - but only if moderate or large pupils</td>
<td>Ensure that some translation on downgaze is occurring and fit is not steep. If no translation and fit is correct, ask for a negative carrier. Over-refraction – if required add is &gt;1.75, ensure that remainder is worked on the front surface of the lens of the non-dominant eye. Decrease zone over which add is worked if patient has small pupils</td>
</tr>
<tr>
<td>Poor near vision with good centration</td>
<td>Patient cannot wear lens part-time</td>
<td>Reduce amount of add worked on back of lens and increase amount on the front</td>
</tr>
<tr>
<td>Unacceptable spectacle blur</td>
<td>Patient has to blink constantly to be able to maintain clear vision</td>
<td>Increase lens diameter. Increase degree of modified monovision, i.e. reduce add more in dominant eye. Remove all front surface addition in dominant eye</td>
</tr>
</tbody>
</table>

Some of the more common fitting problems and symptoms which occur with RGP simultaneous bifocals are listed in Table 2.
geometry aspherics tend to work less well in highly myopic patients.

- **Degree of presbyopia:** Alternating lenses are ideal for the rigorous demands of higher additions, simultaneous for the correction of the lower. It follows that the addition should be >=1.00 for alternators and <2.00 for the simultaneous candidates. However, where a patient with a high (+2.50) addition is prepared to use top-up spectacles from time to time, they may be very happy with the results provided by simultaneous designs. There is also the possibility of using a front and back surface aspheric to increase the addition as described above.

- **Near vision requirements and near gaze direction:** A patient who spends the entire day engaged in near vision in downgaze is obviously a better candidate for alternating bifocals than a patient who has glancing NV requirements in all gaze directions.

- **Occupation:** VDU use does not work well with alternators, although laptop users should not have a problem with alternators. One should consider the patient’s visual tasks in relation to gaze direction.

- **Pupil size:** In advanced presbyopia (additions >2.00D) pupils tend to be smaller and alternating vision can work better. In earlier presbyopia, the pupils are larger and simultaneous designs tend to be indicated.

- **Lid anatomy:** This will help us choose between alternating and simultaneous vision. A low lower lid and/or a loose lower lid is a contra-indication for alternators.

- **Expectations/motivation:** The success of any bifocal/monovision system depends on sufficient motivation on the part of the patient. It is important not to raise expectations too high when dealing with the options for presbyopia, yet also to encourage the idea of freedom from the encumbrance of spectacles.

- **Hobbies:** Clearly, the patient who spends their evenings engaged in crochet has different visual demands to the patient who likes to engage in a social game of golf after work.

- **Personality type:** Our introspective, intelligent patients may find it more difficult to cope with the strictures of presbyopia correction with lenses than our more outgoing patients. However, that should not deter the practitioner, as a patient who understands the complexity of what is being attempted is invariably an excellent source of referrals.

- **Binocular status:** Monocular patients and patients with poorly compensated binocular vision are best kept out of monovision.

**Conclusion**

Without doubt, contact lens fitting for presbyopia is satisfying. It can also be more profitable than single vision correction and is currently a niche activity. Success rates can be at least 70%. The inherently superior optics of RGP lenses mean that the probability of satisfying the visual needs of the patient is that much higher with RGP’s than with soft contact lenses. However, as patients are often new to contact lenses, it is sensible to explore soft options first to see if they will accept the vision they give. Simultaneous vision RGP’s and soft contact lenses give vision in all portions of gaze, whilst alternating designs are dependent on looking down. The visual requirements of the patient’s occupation and lifestyle should be taken into consideration so different solutions can be provided for different activities.

**Acknowledgements**

The author would like to thank David Ruston and Dr Caroline Hodd for their assistance in compiling tables and some text.
Module 1 Part 4 of Modern contact lens practice

Contact lens correction for presbyopia – A simple approach to fitting

Please note there is only ONE correct answer

1. Which one of the following statements is correct?
   a. Bifocal contact lenses never give satisfactory vision
   b. Multifocal contact lenses never give satisfactory vision
   c. Bifocal contact lens fitting is more time consuming than single vision
   d. Bifocal contact lenses are very difficult to insert and remove

2. Whose patent is used by Johnson & Johnson Vision Care in its Acuvue Bifocal contact lens?
   a. John de Carle
   b. Irving Fatt
   c. Sheldon Wechsler
   d. George Mertz

3. Which one of the following is the most popular option for presbyopic correction for contact lens wearers?
   a. Distance contact lenses and reading spectacles
   b. Alternating vision RGPs
   c. Acuvue Bifocals
   d. CIBA Dailies Progressives

4. Which one of the following bifocal designs has been discontinued due to manufacturing costs?
   a. Diffrax
   b. Simulvue
   c. Tangent Streak
   d. Presbylite

5. A true bifocal is one that:
   a. allows the patient to read without the need for additional reading spectacles
   b. can be worn for 30 days continuously
   c. works on the monovision principle: 100% distance one eye, 100% reading the other
   d. gives 100% distance sight and 100% reading sight by alternating

6. Which one of the following anatomical features produces the greatest effect on the translation with alternating lenses?
   a. Lower lid
   b. Upper lid
   c. Distance between the lids
   d. Interpupillary distance

7. What has little or no effect on the orientation of an RGP alternating bifocal?
   a. Gravity
   b. The amount of prism ballast
   c. The shaping of the top edge
   d. The size and position of the truncation

8. When is it permissible to use RGP fitting sets?
   a. Always, providing professional guidelines are followed on lens cleaning
   b. Only on patients over 80 years
   c. Only if the lens is disposed of by incineration following medical guidelines

9. A concentric lens works best when:
   a. the pupil is small
   b. the pupil is large
   c. the pupil is vertically oval
   d. the eyes need more than 1.75D addition

10. An alternating lens works best when:
    a. the pupil is small
    b. the pupil is large
    c. the pupil is vertically oval
    d. the eyes need less than 1.50D addition

11. Which lenses are most likely to cause spectacle blur after all day wear?
    a. Alternating RGPs
    b. Back surface aspheric multifocal RGPs
    c. Low water content soft multifocals
    d. Monovision RGPs

12. Which RGP lenses should be fitted with good centration as a prerequisite to reasonable presbyopic correction?
    a. Alternating bifocals
    b. Monovision
    c. True concentric bifocals
    d. Aspheric multifocals

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