



Essential contact lens practice

Part 8 – Managing the presbyope

Practitioners can expect a rise in presbyopic patients attending for contact lens fitting over the next few years. **Jane Veys, John Meyler** and **Ian Davies** continue their series by outlining the options and techniques available to correct presbyopia with contact lenses. **C7603, three contact lens points** suitable for optometrists, DOs and CLOs

As the number of patients wearing contact lenses around the world grows, so does the number requiring presbyopic correction. Many patients fitted with lenses are now beginning to experience presbyopia and demand satisfactory correction without recourse to spectacles.

There is also the demand from presbyopic hyperopes who, on reaching presbyopia, now need full-time correction for distance and near and, with more active lifestyles and increased awareness of contact lenses, are asking for contact lens correction. The number of presbyopic patients in Europe is on a steady incline and is forecast to grow further over the next five years. Practitioners can therefore expect to see an increase in the number of presbyopes attending for contact lens fittings over the next few years.

As the size of the presbyopic market increases so to does the number of options of correcting presbyopia with contact lenses. The history of contact lens correction of presbyopia has been one of products being launched onto the market with claims that have not always been realised in practice. This has led to scepticism by some practitioners and a reluctance to fully embrace fitting presbyopes with multifocal contact lenses. Before looking at the techniques required to correct presbyopia with contact lenses, we should be aware of the available options as shown in Figure 1.

Spectacles

Probably the most common method of correcting the contact lens-wearing presbyope is with a pair of reading spectacles worn over the distance contact lens correction. These may either be a full-frame single vision, multifocal or a half-eye depending on the needs of the individual. Such correction puts the presbyopic contact lens wearer in

the same category as the presbyopic emmetrope. The advantage of this technique is that the contact lens correction requires no modifications which, assuming that it is optimum at the time of fitting, remains the case.

The obvious disadvantage is, of course, that the principal reason for contact lens wear is being ignored. Contact lens patients do not want to wear spectacles, because, if they did, they would be doing so already. Consequently pure contact lens options should be explained first to the presbyopic contact lens wearers followed by spectacle correction option if appropriate.

Monovision

Monovision is the correction of one eye with the distance prescription and the contra-lateral eye with the near prescription. It works on the principle that the visual system can suppress the central focus image and, thus, enable the object of interest to be seen clearly. Monovision remains an effective means of correcting presbyopia with contact lenses, and,

KEY POINTS

- The number of presbyopic patients requiring contact lens correction is increasing and is predicted to continue to do so over the next five years
- In fitting the presbyope, the practitioner should have access to a number of different lens designs and be aware of alternative fitting approaches
- The availability of single use disposable trial lenses allows ease of trial for both patients and practitioners
- Lens power adjustments should not be based on objective visual acuity alone
- Subjective visual performance assessment is most effectively achieved by experiencing lens wear in both the work and home environment
- There is a significant untapped opportunity for contact lens correction of presbyopes

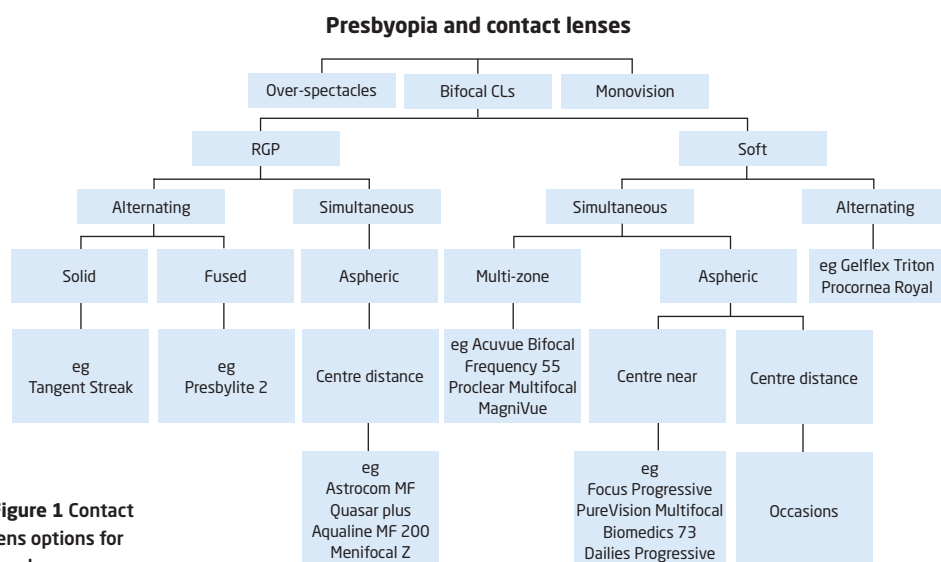


Figure 1 Contact lens options for presbyopes



Relative success rate of monovision vs bifocal contact lenses

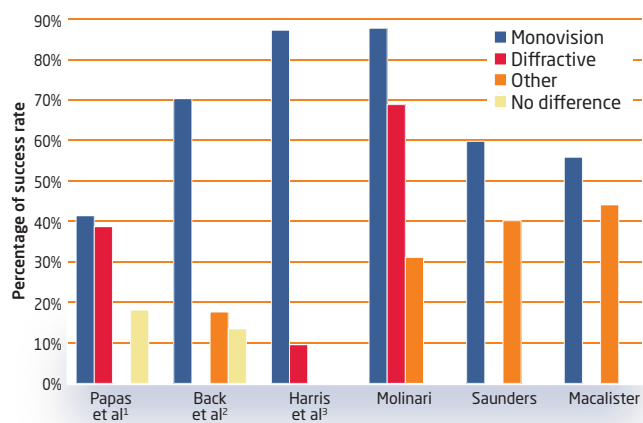


Figure 2 Comparison of success rates of monovision with a variety of different bifocal contact lenses



Figure 3 The principle of the translating bifocal contact lens

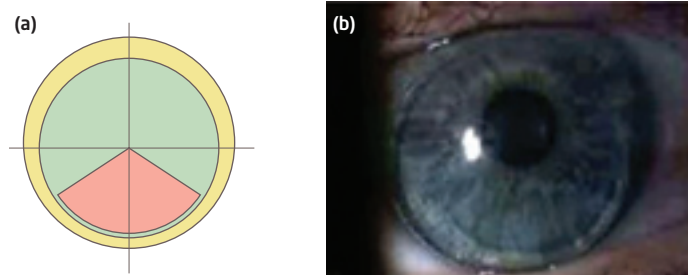


Figure 4 (a) Triangle shape seg design (b) Triangle shape seg in primary position of gaze

as such, an understanding of its indications and contraindications is essential to the practitioner dealing with presbyopic patients.

Monovision clearly disrupts a patient's stereopsis and, for some patients who have either little tolerance for visual disruption or who are engaged in detailed visual tasks, this disruption might prove too great. While some investigators have tried to develop predictive tests to assess which patients might prove suitable for monovision, these have not proved to be as valuable as simply allowing the patient to try the lenses. An advantage of monovision is that it allows the practitioner to choose the most suitable lens for the patient (such as the material type and design) without having to add the compromise that might exist with a particular bifocal design.

Whenever monovision has been compared directly with current bifocal or multifocal contact lens in controlled clinical trials that have been published, monovision has had a success rate equal to or above that of the bifocal in question (Figure 2). However, since these studies were carried out, many newer simultaneous designs have been made available to practitioners. A more recent study by Dutoit *et al*⁷ has shown that adapted monovision wearers rated many aspects of subjective vision performance higher with simultaneous vision bifocal contact lenses. These included distance vision in good and poor lighting, driving at night and depth perception. Near vision in poor lighting was rated higher during monovision wear. In addition, existing successful monovision wearers when refitted with simultaneous vision bifocal contact lenses preferred the bifocal contact lens correction (68 per cent) compared to monovision (25 per cent) after a six-month trial.⁸

In general, less compromised near visual acuity performance in all illuminations provided by monovision is an indication for consideration of this type of fitting option for presbyopes with strong near vision demands. Whereas when critical or sustained tasks requiring good distance binocularity predominate, it is advisable to avoid monovision or to consider supplementary correction.

Alternating bifocals

The alternating, or translating, bifocal was one of the first types of bifocal contact lenses to be produced. The patient looks through the distance portion of the optic zone in primary gaze (Figure 3). On down gaze, the lens is held up against the lower eyelid, so the visual axis looks through the near portion. The advantage is that visual quality will remain high as long as the visual axis is directed through the appropriate part of the lens. The disadvantage is that for this to occur significant eyelid/lens interaction needs to occur, which can lead to decreased patient comfort through increased lens bulk and mobility. The majority of alternating designs are available as rigid gas-permeable lenses. However, more recently a number of soft alternating vision designs have become available (Figure 4). The challenge is to produce a lens with a different-powered near portion while maintaining a smooth passage of the upper eyelid over the anterior surface. The two distinct portions that make up an alternating lens may be either fused or solid portions with a range of alternative segment shapes (Figure 5). Prism, truncation or both controls lens stability, position and translation in rigid designs. Soft lens designs use prism and other design features used in soft toric

lenses to stabilise the lens.

Simultaneous vision designs

Simultaneous vision bifocals rely on an optical system that places two images on the retina simultaneously and then relies on the visual system to 'select' the clearer picture (versus monovision in which a clear image is placed on each retina, the confusion occurring at a higher part of the visual pathway). Early simultaneous vision bifocals had discrete zones of distance and near vision (Figure 6). In more recent designs, the power distribution across the lens surface has been variable and lenses have been described as multifocal, aspheric or progressive (Figure 7) and are available in both soft and rigid materials. Other lens types use a 'modified monovision' approach by using different bifocal designs in each eye. Alternatively lens designs can consist of a number of concentric zones to control visual performance in varying illumination levels (Figure 8) or involve a combination of diffractive and refractive optics to achieve bifocal correction (Figure 9).

There is potential for some confusion in using the term multifocal or progressive because it implies a similar mechanism to a multifocal spectacle lens. In simultaneous vision contact lens systems, the basic principle of the system remains the same irrespective of whether the power varies in a discrete or progressive manner across the surface. Simultaneous vision contact lenses may be further subdivided according to whether the power distribution across the surface is either centre-distance or centre-near.

The availability of single-use disposable soft trial lenses in newer designs, daily disposable multifocals and silicone hydrogel bifocals, as well as empiri-



cally ordered aspheric RGP lenses, has resulted in an increased prescribing of this form of lens correction. However it still represents only 4-14 per cent of new fits in the UK,⁹ suggesting it is not yet an integral part of contact lens practice.

Aspheric

Centre distance

A centre-distance lens usually has a back surface aspheric curve resulting in the central portion of its optical zone for distance vision, which is surrounded by an area containing the power of the lens required for near work. This is achieved by the aspheric curve inducing positive spherical aberration. Rays of light from a distant object are focused by the central zone on the retina and compete with the out-of-focus rays being formed by the surround (Figure 10). When regarding a near object, the reverse occurs, and this time it is the light rays from the peripheral zone that come into focus. The visual system then picks out the clearer of the two images.

The greater the eccentricity (or rate of flattening) of the back surface aspheric curve the higher the reading power in relation to distance power. However, the higher the reading addition, the more likely that distance vision will be affected adversely, especially in low contrast and/or low light conditions. Current back surface aspheric soft lenses are therefore recommended for early presbyopia only (up to +1.25D). In soft lenses, the aspheric back surface will not normally have any significant impact on fit, but in RGP lenses the back surface geometry may depart significantly from corneal topography. This is due to rapidly flattening back surface aspheric geometry and will be fitted significantly steeper to allow appropriate lens centration.¹⁰ Back surface aspheric RGP lens designs can now be based on corneal topography and ocular prescription to create an individual lens design for correcting presbyopia.¹¹ The aim is to modify the combined optical system of the lens, tears and cornea to provide a predictable multifocal effect.

Probably the most fundamental concern with a centre distance system is in its dependency on the pupil size. The near pupil reactions means that as a near object is brought into view proportionally, less of the pupil allows light in from the near zone of the lens.

Centre near

Centre-near bifocal and aspheric designs were introduced to address the problem

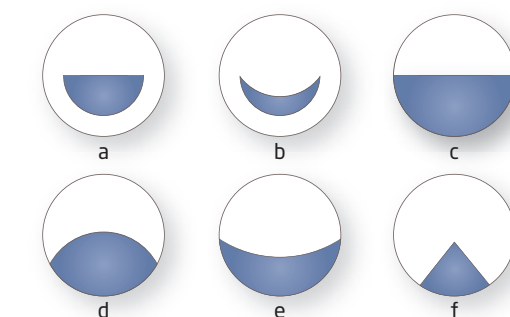


Figure 5 Bifocal segment shapes. Fused, A=straight top, B = solid one-piece, C=straight top, D= reversed crescent, E=crescent, F= triangular

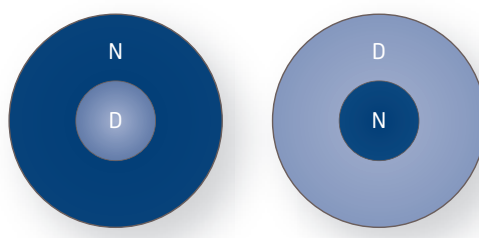


Figure 6 Left: bi-concentric centre distance design; Right: bi-concentric centre near design

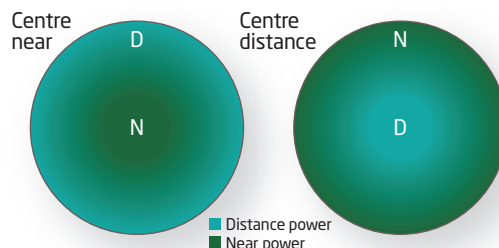


Figure 7 Left: front surface centre near design; Right: back surface centre distance design

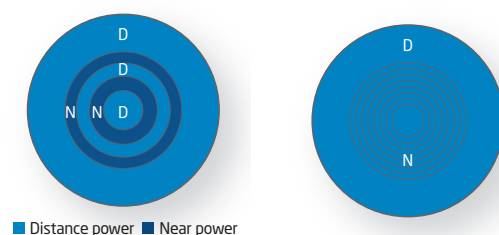


Figure 8 Multi-zone concentric centre distance design

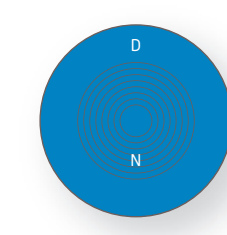


Figure 9 Diffractive design

of pupil constriction for close work. The optical principle is the same as for the centre-distance lens, although reversed, so this time it is the central portion of the lens that forms the light from close objects and is surrounded by the required distance power (Figure 11). Front surface soft aspheric designs promote negative spherical aberration and the aspheric curve can be calculated to limit the spherical aberrations of the eye and, if necessary, of the lens itself. The improvement of retinal image quality and increase in depth of focus can be effective at correcting the early presby-

ope (up to +1.50D). Apart from the visual demands of the presbyope, it would also be expected that visual performance would depend upon the interaction of the optical characteristics of the particular lens design with the aberrations of the eyes of the wearer. Consequently, variations in ocular aberration between individuals may explain in part why lenses of this type meet the needs of some wearers but not others.¹² As presbyopia increases, correcting the wearers spherical aberration alone will not be sufficient and the front surface curve must have a greater degree of asphericity to allow more plus refractive power within the optical system. This often involves more complex surface geometry of varying eccentricity to allow stabilised distance and near power zones within a specified area which is design dependent.

As the pupil constricts, the distance vision becomes progressively blurred, which could lead to significant problems, such as when driving a car in bright sunlight. These lenses can be fitted with a view to reducing the add power in one or other of the eyes to help address this problem – a 'modified monovision' technique.

Multi-zone concentric

Centre distance

It became clear that with future designs, greater attention should be paid to minimising the dependency of lens function on pupil size, especially in relation to different lighting conditions. One approach is to increase the number of concentric zones alternatively powered for distance and near vision. This concept resulted in a centre-distance multi-zone design consisting of five alternating distance and near powered zones (Figure 8). The width and spacing of the zones is based on the variation of pupil size in different illuminations within the presbyopic population. Theoretically, the lens design favours distance vision in extreme high and low lighting conditions and provides a more equal ratio of light division in ambient illumination conditions.¹³ The multiple ring configuration is designed to provide vision which is more specific to the available lighting conditions. Transition curves between the concentric zones are such that the zones are not readily visible on the slit-lamp biomicroscope.

Modified monovision

These lens designs use a modified monovision approach in that the lens used for the dominant eye is a centre distance lens design while the lens for the other eye is centre near in design. Lens

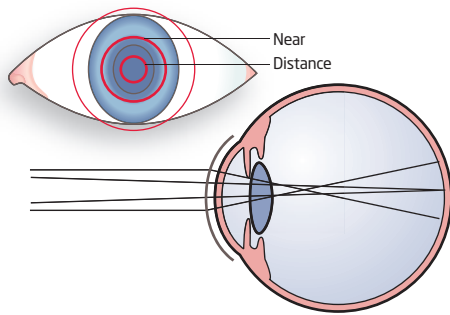


Figure 10 Principle of a simultaneous vision centre-distance design

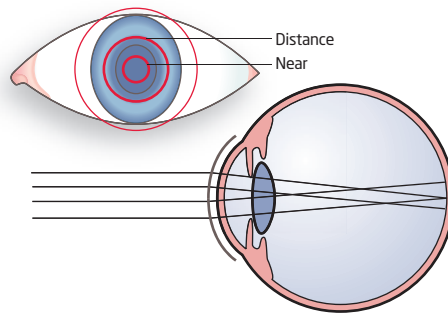


Figure 11 Principle of a simultaneous vision centre-near design

designs can use aspheric surfaces, spherical surfaces or a combination of both with unique zone sizes to produce two complementary but inverse geometry lenses (Figure 12). Each lens is a multifocal and the intention is that binocular summation will still occur, providing acceptable vision at all distances under binocular conditions. This type of lens design results in a modified monovision approach with the first pair of lenses trialled.

Diffractional bifocals

Diffractional lenses work on the principle of placing a phase plate on the rear surface of the lens, which is able to split the light passing through into two discrete focal points, one for distance and the other for near vision. This design was available in both soft and rigid materials but neither products are currently available.

Instrumentation

The basic instrumentation required for presbyopic contact lens fitting is the same as that needed to fit a regular RGP or soft contact lenses.

Lens trial

It is essential to be able to trial a lens, regardless of the design, which is as close as possible to the patient's refractive needs. This can be ordered empirically or, ideally, be made available from in-practice single-use fitting banks. This allows a more realistic assessment by the patient and practitioner as well as allowing vision assessment in the work and home environment. To assess the outcome of a fit, the patient has to experience vision as it will be in the final lens. Judging success simply by measuring acuity alone will not provide an effective predictor of outcome.

Visual assessment

As indicated above, the assessment of visual acuity alone is a poor indicator of success with presbyopic – and indeed much non-presbyopic – contact lens practice. Practitioners must have tools

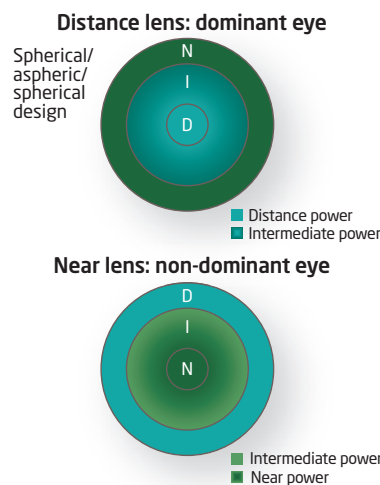


Figure 12 Distance lens: dominant eye spherical/aspheric/spherical design

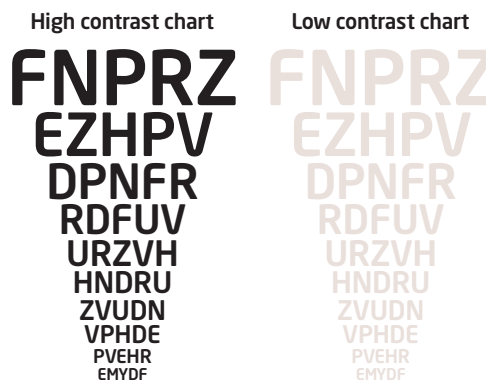


Figure 13 High and low contrast visual acuity chart

available to help both themselves and patients judge the visual performance. High and low-contrast visual acuity charts (Figure 13) give more information about acuity, and, in particular, the difference in low-contrast acuity between spectacles and contact lenses gives some indication of possible success.

As well as the visual acuity charts, the practitioner should have access to other near tasks, such as the opportunity to sit patients at an office desk viewing a VDU screen (possibly in the reception area) and a wide variety of different coloured paper and contrasts of type. Needles, threads, screws, nuts and bolts can also

provide useful visual props in helping to assess visual performance.

Lighting

Lighting plays an important part in seeing, particularly in assessing vision for the presbyope. Ideally, the consulting room should have a wide range of lighting possibilities. These should range from bright, direct illumination on targets to maximise the chances of a patient first seeing the in-focus image, through to the ability to decrease the level of illumination so visual performance at, or near, darkness can be assessed. It might also be valuable to have a glare source on or near visual tasks to help in assessing the effect of glare on vision.

Techniques

The techniques for correcting presbyopia with contact lenses will vary from lens type to lens type. There are, however, certain fundamental principles in presbyopic correction that will be discussed in detail in this article, with reference to the type of correction being made. The reader is referred to individual manufacturers' fitting guides for more details. As with all contact lens fitting, the practitioner must ensure the patient is suitable to wear lenses. As the eye ages, a number of conditions might affect this suitability that have to be taken into account – in particular, tear quality, quantity as well as eyelid tone and position. It is also important that the patient is given realistic expectations about the likely level of vision and the compromises that are inherent in this type of contact lens correction. This involves discussing the benefits of combined distance/near correction without the need for spectacles, as well as likely differences between the vision performance of monovision, simultaneous or alternating vision lenses. When compared to spectacles or single-vision contact lenses, this may take the form of reductions in visual quality, especially in low luminance, stereopsis and reduced intermediate vision depending on the



type of lens fitted. It is also an opportunity to explain to the patient that a period of adaptation is required (just as with bifocal or progressive spectacle lenses) and it is normal that fitting requires more than one appointment to trial alternative lens powers and fitting approaches. When getting started with this form of lens fitting, it may help to start with selecting patients that are generally accepted as being 'better candidates' versus choosing what might be considered a more challenging patient to fit successfully. Table 1 summarises one approach for different patient types when considering monovision fitting, simultaneous vision and alternating vision fitting.¹⁴

Monovision

● **Physical fit** – the physical and physiological fit of a contact lens required to correct presbyopes by the monovision technique will be the same as the fit required by one used without modification.

● **Ocular dominance** – monovision works because the visual system is able to suppress the blurred foveal image in an eye. In general, the visual system is better able to suppress an image in the non-dominant rather than the dominant eye, and it is for this reason that ocular dominance should be assessed. An empirical means of assessing ocular dominance is to ask patients if they are right or left handed and assume that ocular follows motor dominance. While this is true in many cases, there are some in which the reverse is true and others for which there is no strong dominance, a valuable finding in itself.

Alternative and preferred means of assessing ocular dominance include 'pointing' and 'sighting'. In the former, patients are asked to clasp their hands together with forefingers pointing out like a child pretending to fire a gun. They are then asked to keep their eyes open and to point the fingers at one of the practitioner's eyes, with the practitioner sitting at the opposite end of the room. The practitioner then looks to see which of the patient's eyes the fingers are lined up with – this is the dominant eye.

In sighting, the patient holds a card with a hole at arms length, with the practitioner asking him or her to view a distant object. Once the object is sighted, the practitioner again looks to see which of the patient's eyes is lined up with the object. This is the dominant eye.

An alternative approach to preferential looking is termed the +2.00D blur test. This involves placing the best binocular distance refraction in the trial frame and, while the patient looks at

TABLE 1

Patient selection for presbyopic contact lens correction¹⁴

	Patient selection		
	Monovision	Simultaneous	Alternating
Good candidates (getting started)	Significant refractive error	Existing soft lens wearers who are emerging presbyopes	Early and advanced presbyopes
	Reading postions other than standard downward gaze	Moderate intermediate vision requirements	Lower lid above, tangent to, or no more than 1mm below the limbus
	Current contact lens wearers	Spherical or near spherical refractive errors	Myopic or low hyperopic powers
	Motivated and realistic expectations	Willing to accept some compromise in distance vision	Normal to large palpebral apertures
			Normal to tight lid tension
More challenging candidates (more experience required)	Emmetropes, previously uncorrected hyperope, low myopes	Do not desire any compromise in distance vision	High hyperopes
	Concentrated specific visual needs	Moderate hyperopic refractive correction	Small palpebral apertures
	Dry eye symptoms or clinical signs	Emmetropic or near emmetropic distance refractive error	Loose lower lids
	High visual demands and expectations	Would benefit from a toric correction	
		Small pupil size (<3mm)	

Adapted from Bennett E S 2007

the lowest line they can read, a +2.00D is placed alternatively in front of each eye. The patient indicates when the vision is clearest. If the +2.00D lens is in front of the left eye when the image is reported as clearest then the right eye is considered as distance dominant and vice versa. It has been found that that unsuccessful wearers became successful after switching near and distance corrections contrary to the dominance as measured by traditional methods but rarely contrary to the +2.00D test.¹⁵

● **Trial lens power selection** – for the majority of patients, a good starting point in selecting appropriate lens power is to fit the dominant eye with the distance correction and then the non-dominant eye with the full-near correction. It is also recommended that the practitioner should, at this stage, avoid going into the detailed mechanics of how the vision is being corrected. It is important to correct any astigmatism equal to greater than 0.75D in either or both eyes which, if left uncorrected, can result in reduced visual performance, asthenopic symptoms and poor tolerance.

● **Visual assessment** – the first task for the practitioner is to encourage the patient to suppress each eye to see clearly. The ability to do this occurs at a subcon-

scious level, so the practitioner should not immediately explain how the vision has been corrected. Under binocular viewing, looking at a high-contrast, well-illuminated distance chart, the patient should be asked to read as far down the chart as possible without comment on visual quality. The patient should then be directed towards a high-contrast near type, with illumination again being high to maximise the chances of seeing the image. Once again, the patient should be asked to read as far as possible. If they are unable to read with the distance or the near type, the practitioner should not, at this stage, occlude either eye. Instead, the 'non viewing eye' in the one that has the out-of-focus image should be progressively blurred with spherical lenses until the image comes into view.

When the distance or near type is seen clearly, the amount of blur should be progressively reduced while asking the patient to continue to read. Once the full extent of the blur has been removed, the patient should be asked to view a distant object (if it was the near test that was causing problems before) and then return to reading. This technique will demonstrate the ability of the patient to suppress the 'non-viewing' eye.

Once the ability to suppress has been



demonstrated, the practitioner should optimise the refraction, again binocularly to check that the optimum correction for distance and near has been achieved. It is only then that the practitioner should explain to the patient how the vision has been corrected. The maxim 'show then tell' is probably one of the key factors behind success in monovision fitting.

After static visual acuity has been assessed, the patient should be encouraged to walk around the practice wearing the full monovision correction. It is here that single use trial lenses or frequent replacement lenses are of value in allowing the exact prescription to be fitted and trialled. The dynamic visual assessment should start with an appreciation of the effect of suppression on peripheral acuity before allowing the patient to carry out other tasks, such as judging distance. These assessments are important, both clinically and ethically, in showing the patient the advantages and limitations of the correction.

Ideally, an extended trial period is preferred in monovision correction so that the patient can fully assess the benefits of the correction. Before this occurs, the onus is on the practitioner to explain fully the type of correction fitted and to make sure the patient understands that the adaptation period may involve problems in close work and a 'learning curve' in driving, especially at night. For most road users, monovision still provides adequate visual performance to meet regulatory standards, although the EU directive on driving licences requires that a driver of a Grade 2 vehicle (greater than 750 kilograms) must have a minimum of 6/12 vision in the worst eye. When fitting monovision, and indeed all presbyopic contact lens corrections, the practitioner has an obligation to inform patients of the adaptation that may be required. If a patient is unable to adapt to any visual disturbance caused by monovision in specific situations, a practitioner may consider prescribing a spectacle over-refraction.

Partial monovision

Generally, the acceptance and therefore the success of monovision falls as the reading add increases.^{16,17} As the indicated add exceeds +2.00D, tolerance can often be improved if a reduced reading addition is given. The patient may need 'top up' glasses for small print and possibly additional glasses for driving or a secondary distance correcting contact lens. This form of monovision is ideal for social users whose near vision demands will be lower than full-time wearers. It is also useful for patients who have greater intermediate vision needs.

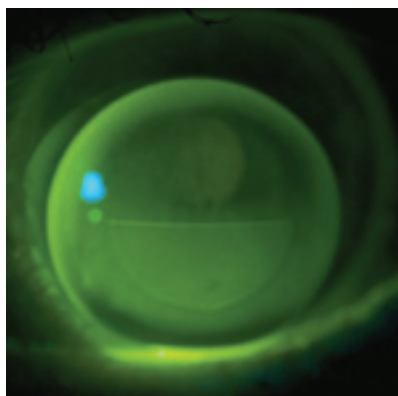


Figure 14a Segment position in primary position of gaze

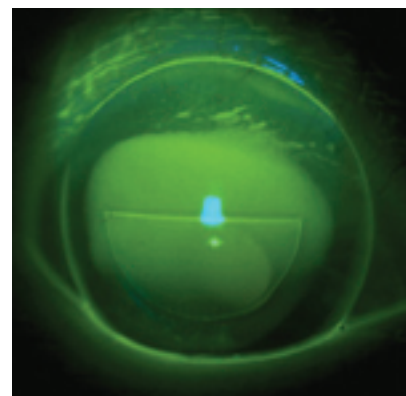


Figure 14b Segment position positioned over pupil in down gaze due to successful lens translation

Enhanced monovision fitting

Enhanced monovision involves fitting one eye with a bifocal lens and the other with a single-vision lens. A variety of options exist. The more frequent approach involves fitting the dominant eye with a single-vision distance lens (spherical or toric) and the non-dominant eye with a bifocal lens. This improves binocular summation and offers some level of stereo-acuity to the monovision wearer that is experiencing increasing blur with a higher reading add. Alternatively the same approach can be used when fitting patients that require sharper distance vision than bilateral simultaneous vision can offer. The bifocal lens in the non-dominant eye usually needs more bias for near. This modification can be achieved effectively by increasing the distance power of the bifocal lens by +0.50D to +0.75D while reducing the add power accordingly.

Alternating vision bifocals

● **Physical fit** – an alternating vision rigid bifocal must be fitted to allow translation between the distance and near zone to occur. The lens should, therefore, be mobile and supported by the lower eyelid. This is normally achieved by fitting on alignment or with minimal apical clearance. In primary gaze, the lower pupil margin should be in line with the top of the near segment (Figure 14a). On near vision, the pupil should look through the near segment (Figure 14b). The fit is most effectively assessed by using a hand-held Burton lamp and fluorescein. The hand-held Burton lamp is preferable to the slit lamp as it encourages a more natural head posture. If the lens does not centre adequately, the fit should be modified.

● **Trial lens power selection** – once the lens fit has been optimised, a normal binocular over-refraction should be carried out at both distance and near. The use of a trial frame and lenses is preferred

to the refractor head as it allows a more natural head posture, which is critical in fitting this type of lens. The practitioner should avoid any consideration of over-plusing the prescription during the refraction. Alternating bifocals are designed to function by having two discrete focal lengths for distance and near. If the only way of achieving a satisfactory result is to dramatically alter the binocular refractive state, the lenses are not being allowed to work in this way and lens translation should be improved or the practitioner should try a straight monovision correction.

● **Visual assessment** – the static visual assessment is carried out in a similar way to monovision. It is, however, probable that a trial frame will have to be worn to provide the correct near refraction. Once again, visual contrast and illumination should remain high to assist the patient in visualising the two images. When assessing dynamic visual performance, the practitioner should demonstrate to the patient the effect of the near addition leading to an area of blur inferiority. As a patient new to bifocal or varifocal spectacles would be instructed, so the alternating vision bifocal contact lens wearer should be aware of this, although this effect will be less than with a spectacle lens due to the reduced vertex distance.

Simultaneous vision bifocals

● **Physical fit** – in contrast to the alternating vision lens, the refractive optic simultaneous vision bifocal should be fitted with minimum, rather than maximum, movement. It is critical that the lens is well centred over the visual axis to enable the correct portion of light to pass through each part of the lens. As the lens decentres, the aberrations increase, to the detriment of vision. The optimum centration should not be achieved to the detriment of the physiological fit of the lens, and the fit should be sufficient to allow tear exchange to occur. ▶



● **Trial lens power selection** – it is in power selection that simultaneous vision bifocals differ to the greatest extent, with different manufacturers recommending different strategies for varying designs. The basic principle in achieving correction is to provide a full binocular correction at distance and near. If the lens is working as a true bifocal, the distance correction should be determined first and the different near additions tested in turn. When assessing distance correction, care should be taken to maximise the plus power of the lens to fully relax binocular accommodation. Although the most effective adjustment options may vary with the lens design being used, most designs are sensitive to 0.25 dioptre adjustments to the distance lens power which can have a profound effect on distance or near visual performance. Lens power adjustments are best investigated by using $\pm 0.25D$ twirls/flippers or trial lenses during binocular vision in ambient illumination or the illumination where problems are being experienced by the wearer. The use of phoropters should be avoided during over-refraction as the resulting light reduction will increase pupil size and alter optical performance. Any distance minus power adjustment should only be made if it has been demonstrated to make a significant impact on distance visual acuity (ie half to one line of Snellen visual acuity) combined with a subjective improvement.

If a satisfactory distance and near correction cannot be achieved, many manufacturers recommend moving towards a 'modified monovision' technique by over-correcting one eye and under-correcting the other. This requires

TABLE 2

Visual quality assessment scale

Grade	Descriptor	Description
5	Excellent	Sharp and clear at all times
4	Good	Occasional periods of blur
3	Satisfactory	Acceptable but slight blur/haze
2	Fair	Blur/haze noticeable at all times
1	Poor	Significant blur, unacceptable

the assessment of ocular dominance and binocular variation to the prescription, as in monovision. The modified approach can be achieved by adjusting the refractive power of the lens or selecting alternative lens designs for each eye to deliberately improve distance vision in one eye, at the expense of near performance while improving near in the other. This can be achieved by increasing the minus/decreasing the plus on the dominant eye to enhance distance vision while decreasing the minus/increasing the plus in the non-dominant eye. A similar bias can be obtained by using different add powers in each, the lower add power being fitted to the dominant eye to improve distance vision. Similarly, one eye may be fitted with a centre distance simultaneous design and the other with a centre near design. Some designs use the lens design itself to deliver a 'modified monovision' fitting approach as the starting point (Figure 12).

● **Visual assessment** – visual assessment, both static and dynamic, should be carried out as previously described. Particular note should be made of the effect of pupil size on visual performance, which should be adequately explained to the patient.

Troubleshooting: poor vision

The most common problem in presbyopic lens correction is inadequate vision. Although the visual acuity might be excellent, the patient could still complain of unacceptable vision because visual quality is not the same as visual acuity, and with many correction options it is unlikely that objective and subjective visual performance will be the same as that experienced through a spectacle correction. Subjective assessment of visual quality, such as a 0-5 scale (Table 2) might help in recording this. If the visual quality is unacceptable, the first step should be to modify the refraction, which is most effectively achieved by placing trial lenses over the patient's eyes and ensuring that whatever improvement is made at one distance is not offset by significant degradation at another. If a lens type is to be changed, the practitioner should only consider switching from one basic principle to another and avoid changing to another design which is based on the same optical principle.

Conclusions

Presbyopes are increasing throughout Europe and the demand for presbyopic contact lens correction will inevita-

TABLE 3

Clinical pearls for presbyopia fitting¹⁸

Set realistic expectations upfront. Success is what is right for the patient and remember the 20/happy rule	Always assess vision performance with both eyes open. Let patient trial lens performance at home and work and have them return in a week for follow-up assessment
Decide your clinical strategy with each patient and avoid trying different designs based on the same optical principle. Consider different approaches including modified monovision and enhanced monovision	Avoid phoropters for over-refraction. Trial frame or flippers are best and look for an improvement in overall vision. Use the Snellen letter chart only to record visual acuity for legal purposes and as a benchmark for future lens changes
Study and follow the manufacturer's fitting advice for any one particular design of lens as they all differ slightly in design characteristics and optimal fitting	Always look for the optimal balance between near and distance vision that meets the patient's visual needs

Adapted from Christie C and Beerten R 2007

TABLE 4

Fitting approach depending on degree of presbyopia¹⁸

Emerging presbyope (up to +1.00DS)
Simultaneous: full correction in both eyes
Monovision: distance and full near
Mid presbyope (+1.25DS to +2.00DS)
Simultaneous: full correction to both eyes
Translation: full correction to both eyes (do not overcorrect add)
Monovision: distance and full near
Late presbyope (+2.25DS to +3.00DS)
Translating: full correction to both eyes
Simultaneous: modified monovision; enhanced monovision
Monovision: distance and partial near; consider top-up spectacles to provide additional plus

Adapted from Christie, C and Beerten R, 2007



bly continue to increase. There is an enormous untapped interest in contact lens wear among presbyopes. Being aware of the different lens designs, fitting approaches and the associated advantages and disadvantages, along with the patients personality, occupation and previous lens wearing history, helps in understanding which is the more appropriate starting point in

meeting the patient's particular visual needs. There are now more lens options than ever to offer our presbyopic patients and the lack of the 'perfect' contact lens solution for the presbyope shouldn't discourage practitioners from fitting this ever-increasing patient base. New simultaneous designs with improved optical performance are now relatively easy to fit and the increasing

availability of single-use diagnostic trial lenses allows effective trials to help eliminate failures prior to dispensing. Daily disposable multi-focal lenses are also available for patients offering even greater levels of patient convenience as well as lens designs available in silicone hydrogel materials.

If the initial lens powers selected fails to provide adequate visual performance, ►

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1 If a +2.00 blur test results in the patient reporting that the image is clearest when the +2.00D lens is held in front of the left eye then:

- A The patient is left eye dominant
- B No strong dominance is present
- C The patient is right eye dominant
- D The patient is left handed

2 Which of the following statements regarding alternating bifocal lenses is false?

- A Fused and solid designs are available
- B They are usually fitted steeper than flattest K
- C Visual quality is high with successful fits
- D Prism is used to control lens stability and position

3 Which of the following statements is false in relation to simultaneous vision lens fitting?

- A Lens centration is important
- B 0.25D adjustments can have a profound effect on visual performance
- C Over-refraction using a phoropter is preferred
- D Objective vision measurement alone is not a good predictor of success

4 Which of the following statements regarding the success of monovision compared to other presbyopia strategies is correct?

- A Monovision is less successful than bifocal contact lenses
- B There is no evidence that monovision is more successful than bifocal lenses
- C Monovision is shown in most studies so far published to equal or better the success rates of bifocal lenses
- D There are no comparative studies yet published in this area

5 What is the main disadvantage of a translating bifocal contact lens?

- A Poor vision
- B Poor comfort due to lid interaction
- C Unavailable in soft material
- D Only available as a fused lens design

6 What is usually meant by the term 'modified monovision'?

- A Alternating the distance and near lens in each eye with every use
- B Having a reduced addition in one eye
- C Having the near lens before the dominant eye
- D Using bifocal lenses adapted to bias one eye to near vision

7 For whom might a back surface aspheric soft lens be most appropriate?

- A The pre-presbyope with high-order aberrations
- B Early presbyopia (+1.25 D or less)
- C Established presbyopia (+2.00 D or more)
- D Presbyope with low grade astigmatism

8 Modified monovision fitting approach involves:

- A Reducing the add power during monovision fitting
- B Fitting one eye with a single-vision lens and the other with a bifocal
- C Ensuring both eyes are fitted with alternative centre-near designs
- D Altering distance or near power to enhance distance vision in one eye and near in the other

9 Which of the following is least useful when assessing the vision through a trial presbyopic lens?

- A A glare source
- B A sample of near task object
- C A low contrast chart
- D A retinoscope

10 Which of the following modalities might be the preferred option for significant refractive error presbyopes?

- A Monovision
- B Diffractive bifocals
- C Simultaneous bifocals
- D Alternating bifocals

11 Which of the following is true for assessing ocular dominance?

- A A +2.00D lens held before the non-dominant eye will be reported as more blurry than when held before the other eye
- B The visual system can more easily suppress the image from the dominant eye
- C The patient is more likely to align the fingers with the sight from the dominant eye if asked to simulate shooting the practitioner
- D Right-handed people are right eye dominant

12 When selecting the power of the trial lens, which of the following is true?

- A Fit the near lens to the dominant eye
- B It is best to explain the mechanics of presbyopic lens design
- C Phoropter heads are useful
- D Astigmatism should be corrected

13 What is the vision requirement for the worse eye of a Grade 2 vehicle driver?

- A >6/9
- B 6/12 or more
- C 6/24 or more
- D >6/60

14 The use of partial presbyopic correction with multifocal lenses and spectacles over the top is described as what?

- A Modified monovision
- B Partial monovision
- C Enhanced monovision
- D Alternating monovision

15 Why is a Burton lamp preferable to a slit lamp for assessing the fit of an alternating bifocal lens?

- A A more natural head posture may be maintained by the patient
- B The light is closer to ultraviolet so better shows up fluorescein
- C The edge of the segment is more clearly defined
- D It has less effect on pupil size

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alternative fitting approaches such as enhanced and modified monovision can be explored. Key fitting tips are summarised in Table 2.¹⁸ With experience, alternating lens designs can be added to the lens choice to offer patients bifocal correction if more exacting visual performance is required. In addition the simplicity of monovision remains an effective solution for many presbyopes. A more systematic approach can be used depending on the stage of presbyopia as shown in Table 3.¹⁸ It is recommended that practitioners select and use two or three alternative lens designs so that a sound clinical approach can be developed and used with confidence, with the result that this form of fitting becomes an integral part of contact lens practice. ●

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