

The products we rely on – Part 4

Prismatic effects on lenses

At what cost?

As many single vision lenses are supplied to prescription houses in finished form, the use of semi-finished blanks in order to work prism can be relatively expensive. However, prism can often be obtained by the decentration of a blank larger than is needed for the frame and in this case, the cost is often lower. There is no practical difference between the two forms of prism.

Multifocals are usually supplied to prescription houses as semi-finished blanks, hence the cost of surfacing them is often included in the "normal" price, and a smaller supplement (if any) is often charged for the working of prism or for large prisms where thicker than normal semi-finished blanks are needed.

The "standard optical centre position" is the mid-point of the horizontal centre line (HCL). Most prescription houses glaze to put the optical centre on HCL or a fixed amount (usually 2-4mm) above

this. They should be able to tell the practitioner the position they use. This often results in the optical centre of the lens not being where it would naively be expected to be, ie in front of the pupil.

Detailed mathematics

Some maths is inevitable when dealing with prisms. However, as most prism calculations are not done by the practitioner or are done with no maths at all, by putting a lens in a focimeter, these will be largely avoided. A knowledge of Prentice's rule and "Sasieni's Rule" (or something similar) is, however, essential, even for those refractionists never intending to dispense a pair of spectacles, as they are vital in interpreting muscle balance results. For the detailed mathematics of prismatic correction, refer to Jalie (1972).

Prism base notation

There are two current forms of prism base notation (BS EN ISO 8429, 1997) and one which is obsolete, but still in occasional use. It is always the base direction which is indicated. The degree symbol (°) must never be used where oblique base directions are specified, as with cylinder axes.

Up, down, in, out (cardinal base directions)

Most muscle balance tests give results as distinct horizontal and vertical elements (base up or down, base in or out) – which is therefore, how they are almost invariably recorded in practice. It is always necessary to specify RE or LE when ordering uncut lenses using cardinal base directions (Figure 1). As this notation is not a dial scale, it is not covered in BS EN ISO 8429, 1997.

360 notation

The prisms can be combined into a single oblique prism and the base direction given in 360 notation. The 360 notation may be useful for setting up some surfacing machinery and is useful in calculations involving prisms. As with 180 notation, it is of little value to the practising clinician beyond this.

In addition, as with 180 notation, it is easier to be accurate with this system than with the cardinal base directions

180 notation

The prisms could be combined into a single oblique prism and the base direction given in 180 notation, as are cylinders, qualified by "up" or "down" (and sometimes in and out). This is easier to read accurately than cardinal base directions on a focimeter, as most have concentric circles rather than squares. It is easier to read than 360 notation, because most focimeter scales only go up to 180. This, however, is the notation effectively made obsolete by BS EN ISO 8429, 1997.

Prentice's Rule

Not having the optical centre on the visual axis results in a prismatic effect. This may be unwanted, or this "decentration" may be used to give a required prismatic effect.

The prism can easily be calculated for spherical lenses and/or in a direction at right angles to the cylinder axis using Prentice's Rule: $P = C \times F$ where P is the prismatic power in prism dioptres, C is the distance from the optical centre in centimetres and F is the lens power in dioptres. The prism base is always towards the optical centre in positive lenses and away from it in negative lenses (Figure 2).

Strictly speaking, Prentice's Rule is not correct, as it ignores the effects of aberrations away from the optical axis and of lens thickness and curvature. The errors it introduces can be quite significant. A much more exact method of calculating prismatic effect is given by Remole (1999), although it is also much more complicated.

A similar effect occurs with aspheric lenses, although their design is such that they are probably best not decentred.

In practice this error may not be significant clinically except where vertical differential prismatic effects are being estimated in high degrees of anisometropia and in high plus lenses – such patients are less likely to be binocular anyway. For single vision lenses, the simple solution if exact prism is required is to look at the uncuts in a focimeter before decentration – which is what any competent glazer would do anyway.

Prentice's Rule and oblique cylinders (and "Sasieni's Rule")

For purely vertical or horizontal decentration, the horizontal and vertical components of the power of cylinder vary as the \cos^2 of the angle to the horizontal and vertical axes respectively. This does not apply to oblique decentration, hence it is only an approximation in many real situations.

This is useful to know when prescribing for anisometropes with binocular vision. The significant effects at near are almost always only vertical. Although individually variable, 1.5-2Δ of vertical

Figure 1

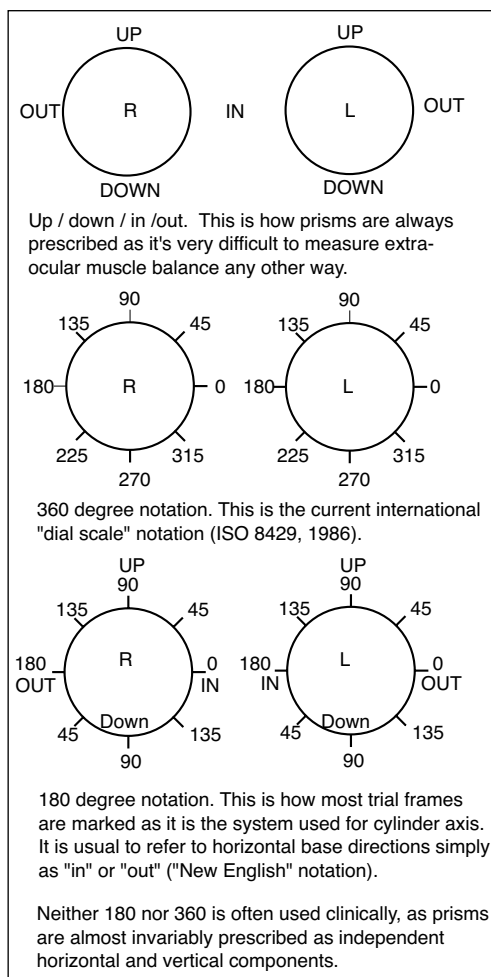
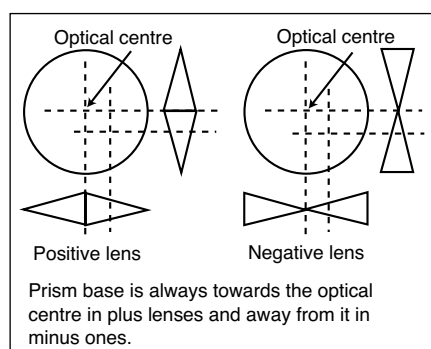


Figure 2



differential prism is a typical tolerance limit. It does not give an exact value – but then again, neither does an “exact” calculation for real situations.

“Sasieni’s Rule”: Prentice’s Rule is applied to the cylinder, ignoring the axis direction, then multiplied by a correction factor.

- For cylinders at 15 or 165, effectively all the power is acting vertically
- For cylinders at 30 or 150, the multiplier is $\frac{1}{4}$ for horizontal and $\frac{3}{4}$ for vertical decentration
- For cylinders at 45 or 135, the multiplier is $\frac{1}{2}$ for both horizontal and vertical decentration
- For cylinders at 60 or 120, the multiplier is $\frac{3}{4}$ for horizontal and $\frac{1}{4}$ for vertical decentration
- For cylinders at 75 or 105, effectively all the power is acting horizontally

For example, +2.00DC x 30: for vertical prismatic element, $\cos^2(30) = 0.75$, therefore treat decentration as for Prentice’s Rule and multiply answer by 0.75. For horizontal prismatic element, $\cos^2(60) = 0.25$, therefore again treat as for Prentice’s Rule and multiply answer by 0.25.

Questionable centration: bending the standards?

It is often possible to make a patient’s spectacles thinner by centring them incorrectly, i.e. giving an unprescribed prism (Figure 3). This should only be done with the prescriber’s agreement, as exact centration may be required for reasons not apparent during the dispensing process.

As the “cosmetic” decentration needed is usually out (i.e. the frame is a bit too large), you will probably get away with this in esophoric hypermetropes and exophoric myopes as long as the amount of prism induced (use Prentice’s Rule) is less than the patient’s heterophoria. You are even more likely to get away with it in patients with squints.

This strategy is not without a small degree of risk to the motor balance, but the cosmetic gains in high prescriptions can be immense, and it is often worth discussing with the patient and prescriber.

Obviously, problems may occur if the prescription is from elsewhere, or if the patient then decides to take the prescription which you have supplied elsewhere – great care must be taken in the wording of any such discussion.

Very often, when the centres of the patient’s old spectacles are checked (particularly if they have a large frame), it is found that this decentration was done by the last supplier without the patient’s knowledge. This will obviously influence the results of muscle balance tests performed. If there are no problems with this incorrect centration, it is often safest to leave it as it is, again ideally with the prescriber’s agreement.

Will there be problems?

A full analysis of binocular vision is seldom necessary when considering cosmetic decentration or prism control multifocals: crude solutions are often more realistic. Put the prism up with the near prescription in a trial frame and allow an adaptation period of a few minutes. It is often worth gradually increasing the prism to encourage

adaptation in preference to putting it all in at once.

In anisometropia, if the patient has their old (single vision) near spectacles and there is little change in the near prescription, get them to look through the bottom of the lenses.

If the patient already has multifocals find out what sort they are, what the vertical centration of the near portion is, and when/if problems occur.

It is possible to perform a trial with Fresnel prisms by putting both prism bases in the same direction, then putting them in the correct direction (or vice versa) to determine even more satisfactorily if prismatic control is worthwhile.

Even if a problem would be expected, it may be worth trying standard multifocals if cost or cosmesis is a major issue and if the near area is only for occasional use. It goes against all our clinical training, but some patients are quite happy to just shut or cover one eye for a short period! An understandable explanation of the problem often “solves” it.

Problems with prisms

The change in prismatic effect from that of a centred lens, or no lens at all, changes the apparent location of objects in space. This is seldom commented upon by patients for “cosmetic” prisms, who are mostly just happy that their spectacles are thinner. Equally, patients with prescribed prisms are usually more interested in the visual improvement.

Looking through a point other than the optical centre changes the effect of the monochromatic aberrations of the lens, particularly at higher powers. This can make the world appear blurred or distorted.

The dispersive effects of the prism present away from the optical centre of a lens can give rise to coloured fringes in lenses of low constriction and/or high prismatic power. This can be a problem with almost any material, although it is rare with Crown glass and CR39. Reflection from lens surfaces may sometimes become more noticeable to the wearer.

“Balance” lenses

“Balance” lenses are commonly prescribed to patients who have one eye which requires a higher correction than the other and through which vision is poor. The power required by the eye with the lower prescription is given to both, usually to improve the cosmetic appearance. It has the secondary effect of eliminating prism differences over the lens area, and so it can also be considered for a presbyope who has always had the poorer eye fully corrected but now

wants multifocals. Obviously, if the better eye requires the higher powered lens, then a balance lens will make the spectacles cosmetically worse.

Balance lenses, probably even more strictly than centration “fiddles”, must only be used if agreed with the prescriber. If a balance lens is prescribed then, although in principle the centration should still be exact, in practice it is usually irrelevant except for the problems indicated previously. Again patients should be made aware of what is being done and why.

Splitting prism

Except occasionally in anisometropia and vertical prism in some forms of multifocal (PALs, E-style), it is neater to split the prescribed prism between the two eyes. This is often slightly more expensive, as two prisms need to be worked. However, as the sag of a lens of a given power and form varies as the square of the distance from the optical centre, savings in thickness can be considerable.

If the prism is prescribed base in or out, then it should be base in or out in both eyes when split. If it is prescribed up or down, then it should be prescribed for and down, then it should be as prescribed in the eye prescribed for and the opposite in the other.

Very occasionally, prism is required for one eye only. Hence, although it is common practice to do so, it should not really be split without confirmation by the prescriber.

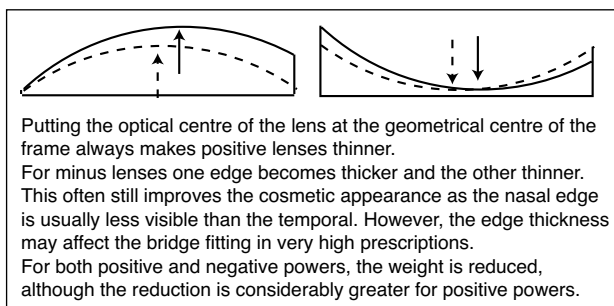
Single vision

Working a prism, as with anything which involves surfacing lenses individually, allows the lens to be worked to “minimum substance”, hence it is often cosmetically better than obtaining prism by decentration on plus prescriptions if your lens supplier would normally use “standard blanks” for such a job. It should never be worse.

In the case of aspheric lenses and lenticulars, the aspherical/ lenticular surface must be centred before the eye. Hence prism must be worked, and decentration should ideally not be used to obtain it. However, even working a prism will upset the optics somewhat.

Fresnel prisms can be used as a temporary measure, but look awful, tend to get dirty and come off if abused (both single vision and bifocals). Smoking may be particularly destructive to Fresnel prisms, dramatically reducing their useful life. They are often used in hospitals for extended trials and as a short term measure, being particularly suited

Figure 3



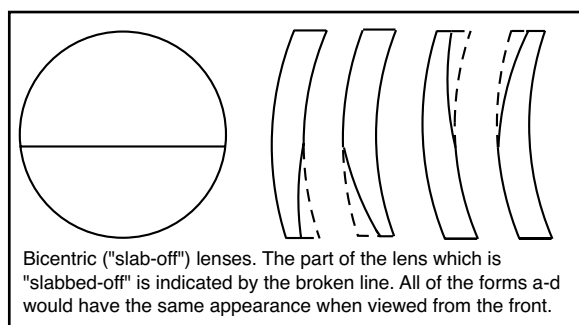


Figure 4

to changeable conditions such as thyroid disease and myasthenia. They always seem surprisingly expensive for what they are.

If differential prism is required at near it can be obtained by making the lens bicentric ("slabbing-off") (Figure 4), by producing a cemented or Franklin type "bifocal", with the same power for distance and near, or again by the use of a Fresnel prism. These are covered in more detail for bifocal lenses in the next section.

Bifocals

There are more options for the control of prismatic effect at near available for bifocals than for other types of lens.

The prismatic effect of the addition

The "jump" at the segment edge is one of the most obvious incarnations of unwanted prism. A more subtle problem is that the whole reading field is displaced from where the patient expects it to be in all types of multifocal. This most notably causes difficulty for myopes who get neck ache from tilting the head back to see a VDU or having to hold reading material too low. It is principally for this reason that round segments, particularly large diameter ones, should be avoided in myopes (Figure 5).

Prism for distance only

It is not possible to obtain prism for distance satisfactorily by decentration in these lens types, because of the need to position the segment accurately, so prism at distance is normally worked on the non-segment surface. This prism is also therefore, present in the segment.

Usually this problem is ignored both by prescriber and dispenser if it is not known to be a cause of difficulty, although this is far from being a satisfactory solution. The alternatives are seldom straightforward and fortunately we usually seem to get away with it.

Strictly speaking, if a prescription has separate distance and near prescriptions (as they should be written on NHS forms) and the prism is only on the distance line (as it is commonly written from laziness), then there should be no prism at near and the more complicated (and therefore more expensive) solutions become necessary if the patient requires multifocals. It would be logical to query any such prescription with the refractionist.

Conversely, if there is a prism in the distance prescription and the near is written simply as an addition, then the logical assumption is that the prism is to be present at distance and near.

Different prism at distance and near

This may be necessary either because different prism is prescribed for distance and near or as a result of having to look away from the optical centre to read, with the resultant differential prism in anisometropia.

The limit of sensible correction differential prism due to anisometropia is quite low as correction can only occur precisely at one point on the lens – as the patient looks away from that point, the prism differences start to occur again. This is not the case with prescribed prism in the absence of anisometropia.

The range of solutions to both situations is the same, but the one adopted depends very much on the individual situation.

Slab-off/moulded ("slab-on") prism

Also called making the lens bicentric, the use of the usual term "slab-off bifocal" was deprecated in BS 3521 (1996), but both terms have been inexplicably omitted from the newer BS EN ISO 13666. In its simple form, this can only be used to remove base down prism (i.e. add base up) on the lower part of the lens, or base up (i.e. add base down) on the upper part.

The amount which can be "slabbed-off" depends on the thickness of the semi-finished blank, hence a thicker than normal blank may be required. This can result in a relatively thick edge on the half without the worked prism. An overall prism is sometimes worked on the pair of lenses to reduce this effect.

A lens which has been "slabbed-off" has a horizontal line across it on the non-multifocal surface. It is therefore sensible to use it with straight-top bifocals where possible (Figure 6). The usual limit of slabbing off is about 4Δ.

A very similar looking lens is made by casting i.e. when the lens is made rather than working it later. These however have base down prism on the same side of the lens as the segment. It is often

Figure 5

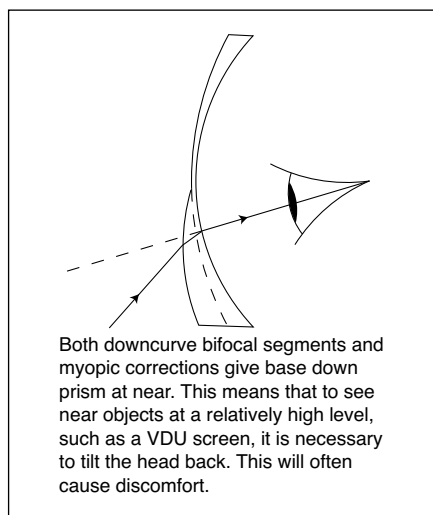
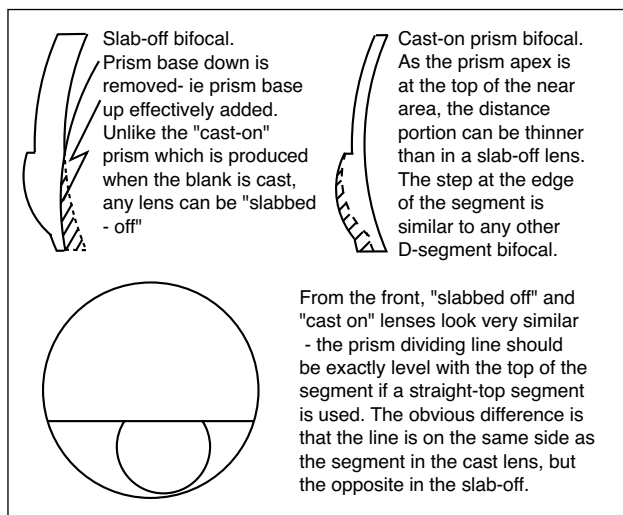


Figure 6



called “slab-on” or “reverse slab-off”, neither of which is a correct description.

If one of each type of lens is used, a vertical prism difference at near of a considerable size can be obtained which is cosmetically quite acceptable. However, there can be problems obtaining both from the same source.

Different sized segments (vertical differential prism)

It can easily be shown that the larger segment is given to the eye which needs base down prism for near – in anisometropia, this is the more plus or less minus lens for distance.

The amount of prism which can be obtained can easily be shown (Figure 7), using Prentice’s Rule (see “jump”) to be $\text{Prism} = \text{Add} \times \text{Difference in segment radii}$.

Although sometimes used in practice and much quoted in the textbooks, both optically and cosmetically this is not an ideal long-term solution for all but elderly presbyope. This is both because the difference in segment sizes needed changes with the add (i.e. as the patient gets older) and, for low adds, the difference in segment sizes needed is such that it usually looks ridiculous or is unavailable.

Another potential problem is that there will be a considerable area of the lenses through which the patient will obtain a near image with one eye, a distance image with the other and an incorrect prismatic correction (Figure 8). The maximum prism difference which can be obtained with a 1.00D add, using readily available segment diameters (largest – 45 round, smallest – 22 round) is 1.15Δ. This becomes 3.45Δ with a 3.00D add.

The advantages of using different segment sizes to obtain vertical prism at near are cost-effectiveness and speed of supply. Standard lenses are used, keeping the cost to a minimum, possibly even less than trying Fresnel prisms, but they are both more stable and cosmetically better. If the correct amount of prism can be obtained by this means, it may be worth trying for this reason alone.

R5 and R9

These are now obsolete. They are ribbon segments with the centres of the circles of which they are part at different distances from the top edge of the segment. They looked good, but were only available as fused glass lenses and offered a very limited amount of control (see section on different segment sizes).

Solid prism controlled bifocals

The term will be reserved here for the “traditional” round segment types. There are a number of very similar constructions, but they are so rare now that it is probably more sensible to treat them together. The segment separately surfaced to incorporate a prism with any base direction. Some can also have different cylindrical corrections for distance and near.

They are distinguished by having a distinct step at the edge of the segment (not to be confused with the discontinuity of curvature at the edge of a normal solid bifocal). The step is greatest at the apex of the prism (Figure 9).

They are historically made from crown glass,

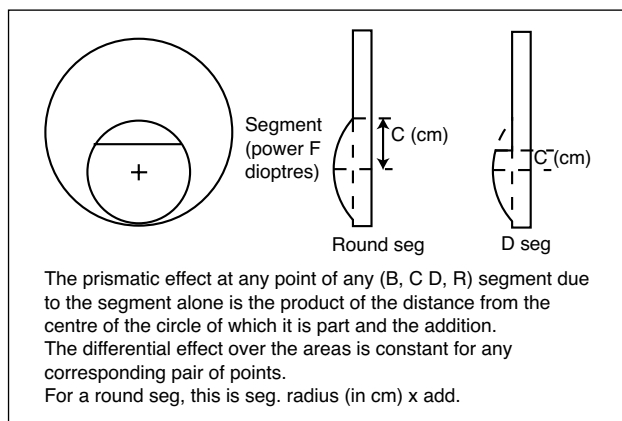


Figure 7

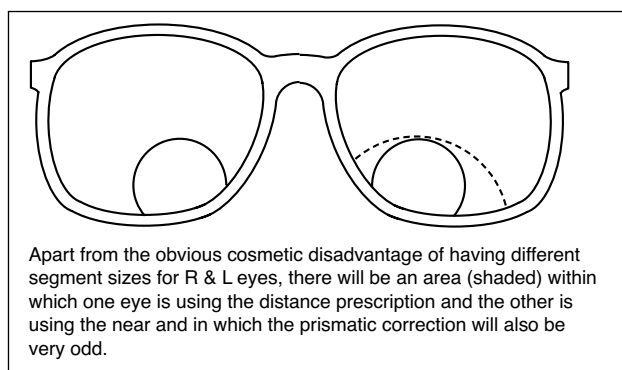


Figure 8

although they can, in principle, be made in any material. Few prescription houses have facilities for constructing them. Delivery may also be very slow from those producing them. If your prescription house is only able to supply them in glass, then the weight and safety problems of that material may mean they are not worth having anyway.

Cemented bifocals

In principle, any prism power, base direction or addition can be obtained with cemented bifocals, although there are mechanical limitations. However, some prescription houses now limit the range they are willing to produce. They are usually made as round segments (usually 22mm or 38mm), although other shapes can be produced.

As the segment is stuck onto the surface of the lens, the total prismatic effect in the segment is the sum of that due to the distance prescription and the segment.

In the classical cemented bifocal, a thin, round (“wafer”) segment was used to give the best possible cosmetic appearance, but such a concept does not allow for the effect of prism. If there is a worked prism in the addition only, the segment will inevitably have one thick edge corresponding to the prism base and D, C and B and any other shape of segment becomes viable.

Traditionally, the segment was stuck onto the back surface of the distance lens, as the segment is less likely to suffer any damage on the back surface. As many lenses are now worked in minus cylinder

form, and safety is seen as more important than it was (and segments on the back could be dislodged into the eye), it is to be expected that cemented segments will now be put on the front surface. Again this may vary between prescription houses.

Historically glass components were glued together with Canada Balsam or “unsealed”. The use of modern glues such as epoxy resins means that these lenses should now be much more mechanically stable than they were and that plastic lenses are feasible.

Franklin bifocals

These were the first type of bifocal made, and can be made with almost any prism power and base direction distance and near, and for any distance and near prescriptions. This is probably the only reason that they are still in use.

They have the further advantage that they can be made using ordinary surfacing machinery, or even from finished single vision blanks if enough prism can be obtained by decentration. The two lenses (distance and near prescription) are edged so that they fit accurately one against the other, giving a result which looks like a badly made E-segment solid lens. This is perhaps quite a good result when the prescriptions usually made up this way are taken into account, but because of the large reading area, they can become very thick with high near prism powers.

Changing the segment inset

To gain a horizontal prismatic effect, it is possible to increase or decrease the inset of the segment.

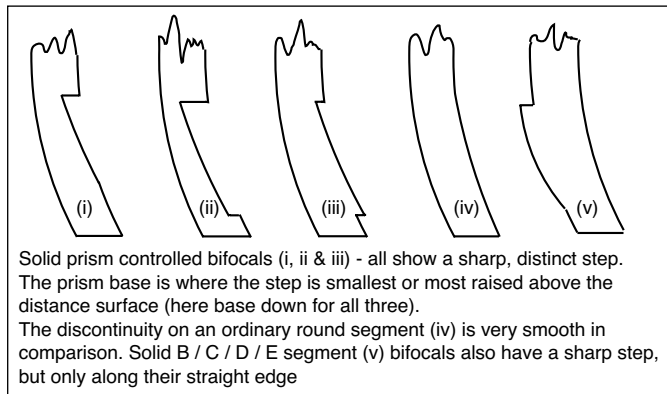


Figure 9

The prismatic effect is (change in inset) \times addition, base in the direction of inset change, hence the amount of prism which can be obtained is limited. This works particularly well with straight top bifocals. With E-style, the change is invisible other than as an increase in the step at the edge of the near portion away from the prism base. If the segment is inset by a large amount, thick blanks may be needed in order to correctly centre the distance prescription.

Fused ribbon segment (B-style)

1.5 Δ -4 Δ base in prism has been available. They are very rare, but look like ordinary B-segment bifocals.

Fresnel prisms

These can be used to see if one of the other types of lenses is worth the trouble (e.g. orthoptics patients) or as a stop-gap where a pathological condition is causing a near muscle balance to fluctuate. They can also be useful to determine if it is principally the horizontal or vertical element of a deviation which is producing symptoms.

Trifocals

The situation with trifocals is very similar to that with bifocals, except that it is much more difficult to correct the prismatic problems, because there are now three areas to consider.

In practice, there is no problem with overall prism, but independent control of prism at prism distance, intermediate and near is much more problematic. Slab-off (twice), Franklin and cemented constructions are feasible, but not for the faint-hearted!

Progressive addition lenses

Progression addition lenses are a problem where prisms are concerned. An overall prism can be worked on the non-progressive surface, but if a different prism at distance and near is needed, there is only slabbing-off.

"Franklin" progressive lenses are also a theoretical possibility, but would have the worst features of both lens types. A cemented on progressive addition with any prism is feasible, but the author has never heard of this being tried either, although a solid lens of this type has been produced without prism control and this may lend itself to "slabbing-off".

All the above methods of prism control at near would obviously look like bifocals, which eliminates one of the principal advantages of progressive lenses. Some prescription houses who will happily slab-off multifocals (bifocals, trifocals) have been reported as being unwilling to slab-off progressives so it is worth checking before ordering such lenses.

Moving the distance centres

If both distance centres are set a bit lower than usual (at the top of the segment is a typical position), then the differential prism for an anisometropia is split between distance and near. Although not entirely satisfactory, this can reduce the prism to an amount which the fusion mechanism can handle. This is not really prism control, but it can work for low degrees of anisometropia (and costs you nothing).

A related and interesting problem with prisms, which occurs in anisometropia, is that the apparent position of the segment top to the patient can be different in the two eyes, even though they are fitted level. The correction in top position for this is usually quite small, and if the distance centres can be tolerated at the same level as the segment top the problem effectively disappears. This can explain why many anisometropic patients wear their spectacles tilted to a degree which would hardly change the prism difference between the eyes (Remole, 2001).

Contact lenses

These can be a solution to the prismatic problems induced by anisometropia, and are probably the most satisfactory solution for unilateral aphakics capable of binocular vision (Winn et al, 1988).

If the contact lenses correct the anisometropia for distance, then the problem of differential prism in the reading area disappears and the most suitable multifocal type can be chosen, as for any other patient.

Two pairs of spectacles

This is the easy option for the requirement for different prism at distance and near. However, it must be remembered that the patient is normally looking straight ahead for distance, but looking down for near. When problems occur, it is probably the one which works the best for many patients, because it is hard for the practitioner to get it wrong

so long as the centres are put in the right place. For some patients whose deviations increase with downgaze, it may be the only practical solution. However two pairs of spectacles are not suitable for everyone!

An alternative that should be considered for patients who are emmetropic for distance, or who do not feel they need a distance correction for everything, is a half eye spectacle. Many of the currently fashionable shallow frames work well for this, as they do not give the wearer the same "image" as more conventional half eyes. Similarly, for distance only prisms in low myopes, a "supra" frame with only a top half lens or a shallow frame fitted high can sometimes work.

Occlusion and balance lenses

Occlusion and balance lenses are occasionally all that can be done for some anisometropic patients who must have multifocals. Neither is very satisfying professionally. Cosmetically a balance is better than a "hammered" or "Chavasse" lens which is probably better than a frosted glass one which may, in turn, be better than an opaque occluder. An eye patch is more likely to get the patient sympathy though!

Conclusion

The optics of ophthalmic prisms is the stuff of nightmares to many an optical student but in day-to-day practice, there is little complicated about them. Prism control at near, if approached sensibly, should be straightforward. The important prismatic effects of astigmatic lenses can usually be estimated easily or simply measured on the focimeter. Prisms can even be used, with care, to improve the appearance of spectacles. Why did we all lose so much sleep over them?

Acknowledgements

The author would like to thank Lyle Gray BSc, PhD, MCOptom, John Mitchell BA, FADO, Nadia Northway, BA, DBO, SRA and Frances McDougal BSc, SRO for their help.

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Multiple choice questions

1. Which of the following CANNOT be effectively used to give differential vertical prism at near only for an equal distance and near prescription R and L?
 - a. Moving the distance optical centres in a bifocal correction
 - b. Different bifocal segment diameters in the right and left lens
 - c. Separate distance and near corrections
 - d. Slab-off on a progressive addition lens
 2. Which of the following is INCORRECT of bifocal lenses?
 - a. The vertical differential prismatic difference obtained by using different round segment sizes for R and L eyes is constant over the segment area
 - b. When obtaining horizontal prism at near by changing segment inset, the prism base obtained is in the same direction as the change in inset
 - c. Prismatic control at near is possible with E-style bifocals
 - d. The segment of prism controlled, cemented bifocals must be a round, C or D type
 3. Which of the following is INCORRECT?
 - a. Contact lenses are the normally the most satisfactory solution when dealing with the prismatic effects due to spectacles for unilateral aphakia
 - b. Slab-off can be used to add base up prism at near on a round segment bifocal
 - c. Solid bifocals can be made with different cylindrical corrections for distance and near
 - d. Prism control cemented bifocals usually have their segment attached using Canada balsam
 4. Which of the following is INCORRECT as a clinical approximation?
 - a. The prismatic effect 10mm directly below the centre of a lens +5.00/+3.00x180 is 8.00D base up
 - b. The prismatic effect 5mm directly below the centre of a lens +5.00/+4.00x150 is 4.00D base up
 - c. The prismatic effect of decentring a lens +2.00/+2.00x165 5mm out is 1.00D base in
 - d. The prismatic effect of decentring a lens -6.00/+6.00x45 5mm out is 1.50D base in
 5. Which of the following is INCORRECT?
 - a. The use of a balance lens can be an effective way of eliminating differential prism in anisometropia if bifocals are to be dispensed
 - b. Patients often like spectacles with unprescribed prismatic effects
 - c. Patients often do not like spectacles with unprescribed prismatic effects
 - d. Chromatic aberration is worse 15mm from the optical centre of a +4.00 lens than with a 6D plano prism of the same material
 6. Which of the following is INCORRECT?
 - a. More control is possible over prism at near only with a progressive addition lens than with a D-segment bifocal
 - b. A D segment bicentric bifocal is usually cosmetically better than a bicentric bifocal with a round segment for vertical prism control at near
 - c. A D-segment bicentric bifocal is usually cosmetically better than different sized round segments for vertical prism control at near
 - d. More control is possible over prism at near only with a cemented bifocal than with a bicentric bifocal
 7. Which of the following is INCORRECT?
 - a. It is standard practice to put the optical centre of single vision spectacle lenses directly in front of the patient's pupil in the primary position of gaze
 - b. Using different sized round bifocal segments to control vertical prism at near, the larger segment gives a base down effect
 - c. Fresnel prisms age prematurely if placed on the spectacle lenses of a heavy smoker
 - d. It is possible to obtain base in prism at near with fused B-segment bifocals
 8. Which of the following is CORRECT?
 - a. Prism base notation is sometimes given using a 180 scale going anticlockwise, with 0/180 on the horizontal meridian, qualified by "up" or "down"
 - b. Prism base is sometimes given using a 360 scale going clockwise with 0/180 on the horizontal meridian
 - c. There is little reason to use 360 prism base notation in clinical practice
 - d. Cylinder axes can no longer be given in 180 notation to conform to current British Standards
 9. Which of the following is INCORRECT?
 - a. It is often possible for exophoric myopes to tolerate prism resulting from decentration out which is not prescribed
 - b. It is often possible for esophoric hypermetropes to tolerate prism resulting from decentration out which is not prescribed
 - c. Centring a patient's distance spectacles to the distance inter-pupillary distance can sometimes cause discomfort in use
 - d. The dispensing optician should routinely split large amounts of prescribed prism equally between the eyes
 10. Which of the following is INCORRECT?
 - a. Prismatic effect (D) = Distance from optical centre (mm) x Power (D)
 - b. "Chavasse" lenses are sometimes referred to as "hammered glass"
 - c. Large diameter downcurve bifocals can exacerbate neck problems in myopes
 - d. It is difficult to obtain satisfactory control of vertical differential prism at near and intermediate in progressive addition lenses
 11. Which of the following is INCORRECT?
 - a. All of the conventional methods of producing spectacles with differential prism control between distance and near look like bifocals or trifocals to the patient
 - b. Tobacco smoke can reduce the life expectancy of some lenses
 - c. A maximum differential prism of 3.45D of base down can be obtained using different sized round segments
 - d. In order to prescribe prism satisfactorily, it is necessary to know the prismatic effect of the patient's old spectacles
 12. Which of the following is INCORRECT of single vision lenses?
 - a. Decentring a positive lens out can be used to minimise the centre thickness of the lens
 - b. Decentring a negative lens out can be used to minimise edge thickness of the lens
 - c. Decentring a positive lens out will often decrease the edge thickness at some point
 - d. Decentring a negative lens out will often reduce the centre thickness of the lens
- The answers will appear with Multifocal lens types – to be published on November 30.