

Anisometropia following cataract surgery and its non-surgical treatment

The desired result of cataract surgery is improved visual acuity without the use of spectacles. In practice most patients following initial cataract extraction are likely to be symptomatic of anisometropia giving rise to prismatic effects (anisophoria) and unequal retinal image size (aniseikonia), this may also occur in refractive surprises following second eye surgery. These changes will cause significant patient distress and difficulties with average daily tasks. Ideally such patients will undergo surgical correction of this or trial contact lenses to improve their symptoms. The following is a discussion of other non-surgical options available.

Anisometropia results in induced differential prism between both eyes as they move away from the optical centres of the correcting lens, with binocular vision particularly affected in the vertical meridian. Aniseikonia occurs as a result of unequal spectacle magnifications; this leads to a difference in cortical image size and resultant binocular vision disturbance. There are individual differences in symptoms and tolerance of aniseikonia but nearly all patients experience distortion in spatial perception with any of the following; headaches, asthenopia and uncomfortable binocular vision.

Unilateral aphakia is possibly the most dramatic form of anisometropia with a spectacle lens creating approximately 30% magnification of the retinal image leading to increased likelihood of non-tolerance. In phakic patients, normal binocular function is rarely found in individuals with more than 5% aniseikonia when wearing spectacle or contact lens correction. When corrected, such cases are likely to suppress the image of the weaker eye, exhibit poor stereopsis and complain of ocular discomfort [1].

Anisometropia with normal binocular function provides the scenario for vertical differential prism problems

in spectacles. Since we have a limited vertical fusional reserve capacity, vertical differential prism may give rise to symptoms or in some cases prevent binocular vision. Duke Elder suggested that vertical differential prism of less than 1 prism dioptre (PD) at the near visual points is unlikely to give rise to asthenopic symptoms. Recent studies have shown as much as 5PDs differential prism at the near visual point may not give rise to symptoms. This is thought to be due to oculomotor prism adaptation as described by Henson and North.

A patient with a significant difference in their spectacle prescriptions between both eyes would require a compensating prism at the off-centre visual point of their lenses. This is usually at the near visual point. Some anisometropic patients, however, are able to adapt to the differential prism and exhibit no symptoms. Some will suppress the unequal images, especially at higher levels. Others, at lower levels may have good fusional reserves and tolerate the differential prism [2].

It is usual for anisometropic subjects, whose existing lenses have not been prism compensated, to be dispensed with the same lens type. It is simple to employ the method above to determine whether a solution to the anisometropia would give any added benefit to the wearer. Providing any change in lens design is minimal, there should be no additional problems with regard to aniseikonia if the subject is currently wearing spectacles and has no symptoms as he will have adapted to different right and left cortical image sizes. When dispensing an anisometrope with first-time spectacles, the issue of aniseikonia may need to be addressed, especially if both eyes have good visual acuities (VAs).

If the disparity of the postoperative refraction is greater than 2 diopters (2D) between the eyes, then there can be a vertical phoria producing diplopia. This

is especially apparent when they use a bifocal segment to read. For example, if one eye is -1.00D and the other is -3.50D, there will be a 2.5D base-down vertical imbalance. This vertical imbalance will impair fusion and cause diplopia [2,3].

Treating vertical imbalance

Contact lenses: Contact lenses will offer the most natural non-surgical solution to any anisometropic prescription in that they remove the prismatic effect that spectacle lenses create when the eyes look away from the optical centres. Contact lenses also give more natural vision in that the differences in retinal image sizes compared to those of spectacle lenses are far less. For example, a +4.00D contact lens will give a magnification of approximately 2% compared to 5% with a spectacle lens fitted at 12mm from the eye. A subject with anisometropia of 4.00D is therefore unlikely to tolerate uncompensated spectacle lenses but should be symptom free when fitted with contact lenses [2,3].

Single vision lenses: Single vision lenses may be decentred to allow the patient to use areas of the lens closer to the optical centre. Patients wishing to use single vision spectacles can adjust their head or reading material to ensure they are looking through the optical centres reducing differential prism [4]. Bifocal users are unable to do this and prism compensation is required. This can be highlighted when refracting a patient – vertical fixation disparity will be present when viewing the test target through the near visual point but not so when viewing a distance fixation disparity target. Contact lenses: as a contact lens will move with the eye differential prismatic effects are not an issue [5].

Bifocals: A larger round bifocal segment has its optical centre lower and thus creates a base-down effect while a flat-top segment has base-up effect. If a

vertical phoria is pre-existing or induced by anisometropia following cataract surgery, the use of dissimilar bifocal segments can be used to correct this. The round-top bifocal segment will limit the off-axis base-up effect of the more hyperopic correction, while the flat-top segment will minimise the base-down effect of the more myopic lens [3].

In prism segment bifocals, the vertical differential prism is neutralised by incorporating neutralising prism within the segment. In slab off lenses, prism is effectively removed from over the reading portion of the lens, resulting in a horizontal visible edge across the front surface. Fresnel prisms can be cut to fit over the reading area of one eye as a temporary measure, they will also aid as a trial prior to dispensing prism compensated bifocals. Franklin split bifocals are distance and near single vision lenses which are cut in two and bonded. Different centration of the two parts is easily achieved hence any vertical differential prism at the near visual point is eliminated. In calculating differential prism, points equidistant below the distance optical centres are chosen; this eliminates the differential prism at that level. The eye then makes a saccadic movement into the segment area and makes a vergence adjustment as necessary [5,6].

References

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Factors to be considered before deciding upon the most suitable solution:

- the degree of anisometropia
- the patient's tolerance of any differential prism
- the likely improvement in the vision with prism compensation
- the degree of aniseikonia and retinal image size differences
- the ability to fuse the different image sizes
- visual acuities
- presence of suppression of one eye
- whether the use of a balance lens would be preferred.



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