

The Effect of Meridional and Overall Aniseikonic Corrections on Perceived Distortion Due to Small Astigmatic Correction:

Bitoric Spectacle Lenses

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Abstract

A 35 year old male had been periodically prescribed a complete correction for his small amounts of astigmatic hyperopia. Compliance was unsuccessful due to the apparent tilting of the patient's visual surroundings. Using measurements obtained on a new eikonometer called the Multi-meridional Apparent Frontoparallel Plane,¹ bitoric lenses were prescribed and supplied. Aniseikonia and visual perception was evaluated with meridional aniseikonia corrected and then with meridional and overall aniseikonia corrected. Only the latter gave the patient full satisfaction.

Patient DH-35, a lift truck operator, had his eyes examined at the School of Optometry Clinic, University of Waterloo. He had recently received a pair of glasses which were prescribed to correct blurred vision of

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Résumé

Un homme de 35 ans s'est vu périodiquement prescrire une correction totale de sa condition d'hypermétropie astigmatique peu prononcée. Il s'est avéré impossible de réaliser le niveau de correction voulu parce que le patient souffrait d'un basculement du champ de vision. Grâce à des mesures prises à l'aide d'un nouvel iconomètre à plan frontal-parallèle apparent à multiples méridiens, il a été possible de prescrire et offrir au patient une lentille bitore. On a évalué l'aniséiconie et la perception une fois corrigée l'aniséiconie méridienne corrigée, puis une fois corrigées cette dernière et l'aniséiconie générale. C'est cette dernière correction qui a donné le plus de satisfaction au patient.

his left eye but was unable to wear them because of a perceived apparent tilt of the surroundings. With the new prescription he noted that his vision was better monocularly; however, binocularly the distortions were pronounced. The prescription was evaluated as:

O.D. +0.25 -0.25 × 90 Base Curve

+5.50

O.S. +0.25 -0.75 × 92 Base Curve
+5.25

Interpolar separation = 64mm
This prescription was altered to equalize the cylinder power, cylinder axis, base curve and centre thickness. The following was prescribed:

O.D. +0.25 -0.50 × 90 20/15 Base Curves +6.00

O.S. +0.25 -0.50 × 90 20/20 Base Curves +6.00

The patient wore these glasses successfully for 3 years. At this time he noted that his vision of his left eye was not as clear as his right eye, and the following prescription was ordered after another visual evaluation.

O.D. +0.25 -0.50 × 90 Base Curve
+6.00 c.t. = 3.0mm

O.S. +0.50 -1.00 × 90 Base Curve
+6.00 c.t. = 3.0mm

The patient returned to the clinic complaining that horizontal surfaces seemed to be tilted down to the right while the walls seemed to be tilting further away from him on the right side. He found this intolerable even after an extended period of wear.

He was referred to the Binocular Vision Clinic and the Aniseikonia Clinic for full evaluation. An aniseikonia assessment¹ on the Multimeri-

dional Apparent Frontoparallel Plane, a recently developed precision eikonometer, indicated the following full aniseikonia correction:
 3/4% meridional magnifier axis 90°
 and 0.5% overall magnifier over the left lens.

With this information and using the basic magnifications formulae^{2,3} a prescription was designed.

Right lens: +0.25 -0.25 × 80°

Centre thickness = 2.0mm
 $n = 1.523$

Front surface = +4.50 sphere

Back surface = -4.53 × 80° / -4.27 × 170°

Left lens: +0.50 -1.00 × 90°

Centre thickness = 3.0mm
 $n = 1.523$

Front surface = 3.00 × 180° / +5.50 × 90°

Back surface = 2.52 × 180° / -6.06 × 90°

This design theoretically corrected all the measured aniseikonia; however, to evaluate the singular effect of the bitoricity of the left lens two pairs of glasses were ordered. The first pair had equal centre thicknesses (spectacle correction No. 1) while the second pair (spectacle correction No. 2) had centre thickness as described above.

Patient observations and further

Sometimes retinal image clarity is sacrificed to reduce distortion caused by astigmatic prescriptions.

evaluations:

Spectacle Correction No. 1 — The patient noted an improvement of clarity of his vision. He noted that horizontal lines no longer appeared to tilt down to the right. He did note, however, that the walls did still appear to be further away on the right side. Re-evaluation with the Multi-meridional Apparent Frontoparallel Plane indicated that with these bitoric lenses another 0.5% overall was needed over the left eye. This was evaluated after two weeks wear.

Spectacle Correction No. 2 — With pair No. 2 (unequal centre thicknesses) the patient noted no distortions, his vision was clear and no visual aberrations were apparent. A perfect fit in all meridians was noted on the Multi-meridional Apparent Frontoparallel Plane.

Discussion

Sometimes retinal image clarity is sacrificed to reduce distortion caused by astigmatic prescriptions. This patient exemplifies a more sophisticated solution that will permit optimum visual acuity as well as distortion-free binocular vision. The example clearly shows that aniseikonia can cause unacceptable perceptual distortions. However, in order to prescribe successfully according to these principles, the aniseikonia should be measured accurately.

References

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