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

Bitoric Spectacle Lenses

K.M. Robertson*  
A. Remole**

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 ekonometer 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 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:

\[ \text{O.D.} \quad +0.25 \quad -0.25 \times 90 \text{ Base Curve} \]

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 bitorique. On a évalué l’anisocorie et la perception une fois corrigée l’aniseiknie méridienne corrigée, puis une fois corrigées cette dernière et l’aniseiknie générale. C’est cette dernière correction qui a donné le plus de satisfaction au patient.

\[ +5.50 \]

\[ \text{O.S.} \quad +0.25 \quad -0.75 \times 92 \text{ Base Curve} \]

\[ +5.25 \]

Interocular separation = 64mm

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

\[ \text{O.D.} \quad +0.25 \quad -0.50 \times 90 \text{ 20/15 Base Curves} \]

\[ +6.00 \]

\[ \text{O.S.} \quad +0.25 \quad -0.50 \times 90 \text{ 20/20 Base Curves} \]

\[ +6.00 \]

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:

\[ \text{O.D.} \quad +0.25 \quad -0.50 \times 90 \text{ Base Curve} \]

\[ +6.00 \text{ c.t.} = 3.0 \text{mm} \]

\[ \text{O.S.} \quad +0.50 \quad -1.00 \times 90 \text{ Base Curve} \]

\[ +6.00 \text{ c.t.} = 3.0 \text{mm} \]

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 Multi-
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 a prescription was designed. 
Right lens: +0.25 – 0.25 x 80°
Centre thickness = 2.0mm
n = 1.523
Front surface = +4.50 sphere
Back surface = –4.53 x 80°/–4.27 x 170°
Left lens: +0.50 – 1.00 x 90°
Centre thickness = 3.0mm
n = 1.523
Front surface = 3.00 x 180/+5.50 x 90°
Back surface = 2.52 x 180/-6.06 x 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 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 Fronto-parallel 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**


---

**REGINA, SASKATCHEWAN**

Second Optometrist Needed for a busy two-location practice. 
Excellent salary with guaranteed minimum. 
Flexible Arrangements

Reply to: Box 186J
Canadian Journal of Optometry
Suite 207 — 77 Metcalfe Street
Ottawa, Ontario
K1P 5L6

---

**FOR SALE**

Optometric Practice in beautiful Penticton, B.C. This is your chance to locate in the wonderful Okanagan Valley and a chance to give your children paradise.

Reply in confidence to:
Box 386J
The Canadian Journal of Optometry
Suite 207 — 77 Metcalfe Street
Ottawa, Ontario
K1P 5L6

---

**GRENFELL REGIONAL HEALTH SERVICES REQUIRES**

An Optometrist for the Charles S. Curtis Memorial Hospital in St. Anthony, Newfoundland effective immediately. This is a 150 bed fully accredited regional hospital providing services for approximately 40,000 people in Newfoundland and Labrador.

This position involves a fair amount of travelling. Applicants must be eligible for registration with the Newfoundland Association of Optometrists.

Salary in accordance with government approved scales. Liberal fringe benefits. Fully furnished accommodations at reasonable rates. Financial assistance given with travel.

**Interested applicants should apply to:**

Dr. Peter Roberts  
Executive Director  
Grenfell Regional Health Services  
St. Anthony, Newfoundland  
Canada  
A0K 450

**TELEPHONE: 709-454-3333, Ext. 120**