



CASE REPORT

Convergence Insufficiency Occurring In Presbyopia

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Introduction

The diagnosis of muscle imbalance has traditionally been made through consideration of Sheard's and Percival's criteria and measures of fixation disparity^{3,4}. Sheard's criterion requires that the opposing fusion vergence limit be twice the magnitude of the phoria. Percival's criterion implies that vision comfort is achieved near the middle of the vergence range.

Presbyopes show relatively large amounts of exophoria when tested at near through the reading correction. Morgan⁷ found the near phoria to average 9^Δ exophoria for presbyopes compared to an average of 3^Δ exophoria for prepresbyopes. The high exophoria can be interpreted as arising from the decreased accommodative vergence available when the near target is viewed through the reading addition. The high exophoria is often tolerated under normal binocular viewing conditions when a stimulus to convergence is present; since presbyopes, unlike prepresbyopes, can exhibit changes in convergence without suffering changes of accommodation². Sheedy and Saladin have proposed that the assessment of fixation disparity at near is an important measure of presbyopic muscle balance as it is a binocular test; hence, a stimulus to convergence is provided.

It is the purpose of this case report to illustrate the use of Sheard's and Percival's criteria and fixation disparity as diagnostic indicators of a

muscle imbalance occurring in a presbyopic patient. These indicators will be further utilized to measure the efficacy of orthoptic treatment given to relieve the imbalance.

The Case

Patient E.S., age 65, complained of asthenopia after one hour of reading. Doubling of the newspaper print was reported. Frontal headaches often followed. An ocular health assessment had been made previously. A medical examination had been advised as observation of the fundi had revealed signs of hypertension.

Refractive examination revealed compound hyperopic astigmatism and absolute presbyopia, which was corrected with his present spectacle prescription.

O.D. $+1.75 - 1.00 \times 095 \approx +2.25$ VA 20/20

O.S. $+1.75 - 1.00 \times 085 \approx +2.25$ VA. 20/20

The binocular findings are outlined in Table I as pre-therapy results. These findings suggest the presence of a convergence insufficiency.

Therapy

Treatment was given over a 3 week period, in which the patient spent a minimum of 20 minutes a day on prescribed home exercises. Two office visits were made at one week intervals during this period. Office and home exercises were designed to increase the positive fusional vergence limit. The techniques used included loose prisms, vectograms, pencil push ups, beads on a string and free fusion stereorings.

The binocular functions were reassessed after the orthoptic programme. (See Table I post-therapy). The patient reported that reading was more comfortable and headaches were absent.

Results

Considering the post-therapy findings in Table I, the effects of training have been:

1. to increase the positive fusional vergence limits by a minimum of 15^Δ at both 6M and 40cm such that Sheard's and Percival's criteria were met.
2. to reduce the near exofixation disparity so that no base in prism was required to relieve it.
3. to eliminate the tendency of periodic suppression when reading.
4. to reduce the asthenopia.

Discussion

Daum⁹ has shown that the positive fusional vergence amplitude can be significantly increased after three weeks of training for a population of prepresbyopes with normal binocular vision. The present case suggests that the positive fusional vergence limits can be improved in a presbyopic individual in a similar time frame. It would appear that the plasticity of this oculomotor system remains well into presbyopia. This finding is in agreement with other studies.⁴

The diagnosis of the imbalance was determined by the fact that Sheard's and Percival's criteria were not met, and that a significant amount of base in prism was required to eliminate the fixation disparity. These same indicators appeared to adequately indicate when the oculo-

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Table I
Binocular Findings for Pre-and Post-Therapy Assessments

	Pre-Therapy	Post-Therapy	Change
6 M			
Unilateral Cover Test	non strabismus	non strabismus	
Phoria von Graefe	2 Δ exo	1 Δ exo	not significant
Maddox Rod	1 Δ exo	ortho.	not significant
pfv limit von Graefe	6 Δ	21 Δ	increased by 15 Δ
loose prism	10 Δ	25 Δ	increased by 15 Δ
nfv limit von Graefe	6 Δ	7 Δ	not significant
loose prism	6 Δ	6 Δ	not significant
Prism to relieve fixation disparity (Mallet)	1 Δ B.I.	0	
Sheard's Criterion	met	met	
Percival's Criterion	met	met	
40 cm			
Unilateral Cover Test	non strabismus	non strabismus	
Phoria von Graefe	16 Δ exo	11 Δ exo	reduced by 5 Δ
Maddox Rod	12 Δ exo	12 Δ exo	not significant
pfv limit von Graefe	10 Δ	28 Δ	increased by 18 Δ
loose prism	10 Δ	25 Δ	increased by 15 Δ
nfv limit von Graefe	24 Δ	18 Δ	reduced by 6 Δ
loose prism	14 Δ	16 Δ	not significant
Prism to relieve fixation disparity (Mallet)	5 Δ B.I.	0	reduced to ortho fixation disparity
Sheard's Criterion	not met	met	
Percival's Criterion	not met	met	
Suppression of 0.37M print on Vectographic Near Card	yes, intermittent	none	
Asthenopia	present	absent	

motor system was brought to within normal limits which was also accompanied by a subjective improvement of reading comfort.

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