TOPIC: Pediatric Optometry

Title
Anisometropic Amblyopia in the Presence of Monofixation Syndrome

Abstract
Monofixation syndrome (MFS) is characterized by the presence of peripheral fusion in absence of bimacular fusion. It can result from anisometropia and cause amblyopia\(^1\). Awareness of MFS expands our understanding of the resulting binocular status.

Case History
A 2-year-old Caucasian male presented to the clinic with parental concern of reduced depth perception. The patient was not on any ocular or systemic medications but had an allergy to amoxicillin and Zithromax. His mother reported an unremarkable family ocular and medical history.

Pertinent Findings
The patient had a cycloplegic refraction of +4.50 OD and +7.00 OS with corresponding visual acuities of 20/30 and 20/125. His ocular motilities were full in both eyes and he demonstrated an orthophoric posture with cover test. Both his anterior segment exam and dilated fundus exam were within normal limits.

Differential Diagnosis
The leading differential diagnosis for monofixation syndrome is microtropia. Microtropia is a unilateral strabismus of less than 5 degrees, harmonious anomalous retinal correspondence with partial stereopsis and more often than not a concurrent slight amblyopia of the non-fixating eye\(^1,2\). Another differential is fixation disparity\(^1\). The 2 key differences between MFS and fixation disparity is that the deviation in fixation disparity is not larger than 6-10 minutes of arc (8-10 prism diopters in MFS) and both macular areas function simultaneously in fixation disparity\(^1\).

Diagnosis and Discussion
The patient in this case was diagnosed with anisometropic amblyopia. Generally, anisometropic amblyopia occurs more frequently and to a worse degree in children with hyperopic refractive errors. This is because the fovea of the more anisohyperopic eye never receives a clear image when viewing binocularly. Anisohyperopia as small as one diopter is sufficient to cause amblyopia\(^4\). Anisometropia is an etiologic factor that contributes as an obstacle to macular fusion\(^1\). Typically anisometropia is discovered at a later age when it is too late to expect bifixation to be the result of correcting for the anisometropia with an optical prescription\(^2-4\). As a result, all anisometropic patients with MFS have amblyopia\(^1\).

According to Marshall Parks, there are four possible sources that cause MFS: (1) primary inability of the patient to fuse similar macular images, (2) secondary to treating strabismus, (3) secondary to anisometropia and (4) secondary to an organic unilateral lesion of the macula\(^1\). The patient in this case demonstrated MFS as a result of anisometropia. Patients with MFS have a form of binocular single vision which is made possible by a demonstrable scotoma in the visual field of the non-fixating eye during binocular vision. There are 5 major characteristics encompassing MFS. The first is a manifest horizontal deviation that is in the range of 8-10 prism diopters or less. Secondly, there is a suppression area within the deviated eye that prevents diplopia. A third characteristic of a patient with MFS is their ability to demonstrate good fusional vergence amplitudes. The fourth feature of MFS is a stereopsis that is within the range of 67 to 3000 arc seconds. And lastly, along with MFS, the patient may also have amblyopia, a superimposed phoria and/or anisometropia\(^3\).

Treatment
The patient was prescribed fulltime patching of his right eye which was continued for 6 months until the visual acuity stabilized at 20/40 for 3 consecutive months at which point patching was reduced to 2 hours per day for two weeks\(^5-7\). The treatment of amblyopia does not affect the scotoma in the non-fixating eye that is present under binocular conditions.
Presently at age 8, the patient’s cycloplegic refraction is +6.50 + 0.50 x 090 OD and +8.25 +0.75 x 090 with visual acuities of 20/20 in the right eye and 20/30 in the left eye. His cycloplegic refraction was reduced by one diopter for his spectacle prescription and recommended for fulltime wear. He is orthophoric with stereo acuity of 80” arc seconds. When tested at distance (20/200 target) and near, the patient is able to perceive the Worth dot test correctly. The four-diopter base-out prism test confirms the presence of a central scotoma in his left eye allowing for the diagnosis of MFS. When the prism was held before the right eye, this resulted in a version movement towards the side of the prism apex. When the prism was held before the left eye, no movement was elicited since the image shift was within the central scotoma.

**Conclusion**

For the patient in the case report it can be concluded that his MFS was the result of a series of events starting with anisohyperopia. The poor image clarity in his left eye led to the sensory adaption of the central scotoma which ultimately led to the development of amblyopia in that eye. The end product of this series of events is then labeled “monofixation syndrome”. Our knowledge of this sensory adaption aids our clinical understanding of the binocular function of patients with MFS. The only visual consequence experienced by the patient is a reduction in stereopsis that in most cases goes unnoticed by the patient. Generally patients are asymptomatic of the condition and cosmetically do not manifest a noticeable deviation.

**References**