Copy effect of myopic anisometropia in a pair of monozygotic twins: A Case Report

Abstract

Introductıon: This case report concerns myopic anisometropia with copy-image in monozygotic twins.

Methods: In February 2021, 6-year-old identical twins were referred to us with the diagnosis of amblyopia in their left eyes from an external center. Both twins had a full ophthalmic examination, which included visual acuity testing, ocular motility testing, cycloplegic refraction, and fundus examination.

Results: On examination, "copy image" myopic anisometropia was discovered. Twin 1 had anisometropia with myopic astigmatism in the left eye. His cycloplegic refraction was +1.00 (-0.75x 75) in the right eye and -8.0 (-1.50x175) in the left eye. Similarly, twin 2 had anisometropia with myopic astigmatism in the left eye. His cycloplegic refraction was -7.75 (-1.50x180) in the left eye and +1.25 (-0.75x90) in the right eye. The best-corrected visual acuity was 20/60 in the amblyopic eyes and 20/20 in the unaffected eyes. There was no ocular deviation. In either patient, a slit-lamp microscopic examination revealed no abnormalities in the anterior parts of either eye. Fundoscopic examination revealed no abnormalities. No abnormal ocular movements were demonstrated.

Conclusion: As is evident from the relevant literature, previous studies with twins were mostly concerned with mirror effect myopic anisometropia and myopic anisometropia, whereas ipsilateral amblyopia and anisometropia were not reported in monozygotic twins. This case underscores the possible genetic basis of myopic anisometropia.

Keywords: Anisometropia, myopia, Twins

Introduction

The difference in refraction between the two eyes is known as anisometropia. Variable breaking combinations and degrees of imbalance are possible. Anisometropia's potential determinants are unknown. Anisometropia (a difference of more than 3.0 diopters) affects 1% to 8.1% of toddlers and young children.[1–4].

Previous studies have found concordances in refractive power, axial length, corneal curvature, and cup-to-disc ratio in monozygotic twins, suggesting that genetic factors may be associated to myopic anisometropia.

Due to the rarity of hyperopic anisometropia, myopic anisometropic monozygotic twins have been reported so far. In this case report, amblyopia in the ipsilateral eye, which developed due to myopic anisometry in a pair of monozygotic twins, is presented.

Case Report:

In March 2021, 6-year-old identical twin brothers were referred to our opthalmology clinic of the University Training and Research Hospital, with the diagnosis of amblyopia in their left eyes from an external center. They had no associated complaints such as deviation of the eyes and there was no history of prior spectacle use. Their past medical histories were unremarkable. They were delivered at full term and there was no history suggestive of amblyopia in the family. Both twins had a full ophthalmic examination, which included visual acuity testing, ocular motility testing, cycloplegic refraction, and fundus examination. In either patient, a slit-lamp microscopic examination revealed no abnormalities in the anterior parts of either eye.Fundoscopic examination revealed no abnormalities. No abnormal ocular movements were demonstrated. Cycloplegic refraction was performed 45 minutes after instillation of 2 drops of 1% cyclopentolate using the Topcon RM-800 auto refractometer (Topcon Medical System, Japan).

On examination, “copy image” myopic anisometropia was discovered. Twin 1 had anisometropia with myopic astigmatism in the left eye. His cycloplegic refraction was +1.00 (-0.75x 75) in the right eye and -8.0 (-1.50x175) in the left eye. Similarly, twin 2 had anisometropia with myopic astigmatism in the left eye. His cycloplegic refraction was -7.75 (-

1.50x180) in the left eye and +1.25 (-0.75x90) in the right eye. The best-corrected visual acuity was 20/60 in the amblyopic eyes and 20/20 in the unaffected eyes. There was no ocular deviation. Fundus examination was normal. After the prescription of glasses, their amblyopia was treated by patch therapy. They were re-examined 6 months later. The best-corrected visual acuity had improved to 20/40 in the amblyopic eyes and 20/20 in the unaffected eyes. Keratometry, axial length (AL), anterior chamber depth (ACD), and lens thickness (LT) were measured with Lenstar LS 900 (Haag-Streit, Koeniz, Switzerland) (Table 1). Consent was obtained from the patient before all procedures.

Discussion:

Anisometropia is defined as the difference in refractive error between the two eyes of an individual. This condition is usually associated with amblyopia and does not always necessarily accompany strabismus. [5, 6] Although studies vary depending on the definition of anisometropia, it has been reported that the prevalence of anisometropia is 5% in school-based and community-based studies on school-age children.[7] Anisometropia, as a type of refractive error, may have a genetic component.[8, 9] These investigations discovered striking parallels in anisometropia amongst monozygotic twins, emphasising a hereditary propensity.

Hammond et al. found that heritability was 90% for myopia, 89% for hyperopia, and 47-49% for total astigmatism in monozygotic and dizygotic twins.[10] Within 3-8 days of gestation, a fertilized egg splits into identical twins. This splitting happens later in mirror image twins, resulting in reverse phenotypic differences between the right and left sides. Although there have been few reports of mirror imaging in the ophthalmic literature, mirror imaging has been detected in roughly 25% of identical twins.[8]

Rosenthal et al. found that corneal power, axial length, and vertical ocular refraction concordances were higher in monozygotic twins than in dizygotic twins in a study of 78 monozygotic twins and 40 dizygotic twins.[11]

Park et al. reported a sister and brother with reverse myopic anisometropia. The difference in spherical equivalents was 12.50 D in the sister and 6.875 D in the brother. Both patients had approximately the same keratometry in their right and left eyes. The axial lengths of the sister

were 25.67 and 24.15 mm, and the axial lengths of the brother were 23.50 and 25.41 mm. It can be used as evidence that extreme myopic anisometropia is an inherited condition.[12]

Farvardin et al. reported that the twins' corneal strength was the same in both eyes, but the interocular axial length difference was 1.21 mm in Twin 1 and 1.19 mm in Twin 2. They claimed that the interocular difference in axial length was the primary cause of anisometropia in these identical twins. The hereditary foundation of hyperopic anisometropia is highlighted in this case.[13]

As far as we have reviewed in the literature, previous studies with twins were mostly concerned with mirror effect myopic anisometropia and hyperopic anisometropia, whereas ipsilateral amblyopia and anisometropia were not reported in monozygotic twins. The corneal power of both eyes of these twins was the same, but the interocular difference in axial length was 3.11 mm in twin 1 and 3.09 mm in twin 2. The main cause of anisometropia in these identical twins was the interocular difference in axial length. This case underscores the possible genetic basis of hypermetropic anisometropia.

REFERENCES:

1. M A, G F, J S (1988) Changes in astigmatism between the ages of 1 and 4 years: a longitudinal study. Br J Ophthalmol 72:145–149.
2. M A, G F, J S (1990) A longitudinal study of a population-based sample of astigmatic children. II. The changeability of anisometropia. Acta Ophthalmol 68:435–440.
3. M A, G F, AK A, J S (1990) A longitudinal study of a population-based sample of astigmatic children. I. Refraction and amblyopia. Acta Ophthalmol 68:428–434.
4. M A, J S (1996) Natural history of infantile anisometropia. Br J Ophthalmol 80:860–863.
5. Amblyopia: a multidisciplinary approach. Proctor lecture. | IOVS | ARVO Journals.
6. (2002) A randomized trial of atropine vs. patching for treatment of moderate amblyopia in children. Arch Ophthalmol (Chicago, Ill 1960) 120:268–278.
7. Prevalence of anisometropia in volunteer laboratory and school screening populations. | IOVS | ARVO Journals.
8. F O, T N, S H (2001) Mirror image myopic anisometropia in two pairs of monozygotic twins. Ophthalmologica 215:435–438.
9. PT DJ, BA O, JT DF (1993) High symmetric anisometropia in monozygotic twins. Ophthalmic Paediatr Genet 14:29–32.
10. Dirani M, Islam A, Shekar SN, Baird PN (2008) Dominant Genetic Effects on Corneal Astigmatism: The Genes in Myopia (GEM) Twin Study. 49:1339–1344.
11. AR R, GK VN (1971) Clinical findings and therapy in unilateral high myopia associated with amblyopia. Am J Ophthalmol 71:873–879
12. Park SJ, Kim JY, Baek S-H, et al (2010) One Sister and Brother with Mirror Image Myopic Anisometropia. Korean J Ophthalmol 24:62–64.
13. HF, M M, M F (2019) Mirror image hypermetropic anisometropia in a pair of monozygotic twins. J AAPOS Off Publ Am Assoc Pediatr Ophthalmol Strabismus 23:113–115.

Table Legends:

Table 1: Biometric data of twins