

Access this article online

Quick Response Code:



Website:

https://journals.lww.com/ojoo

DOI:

10.4103/ojo.ojo_52_23

Case report: Mirror-image hypermetropic anisometropia in nontwin brothers

Hajar Farvardin^{1,2}, Anis Shamsi^{2,3}, Majid Farvardin^{1,2}

Abstract:

Mirror-image is a term to describe a physical characteristic of some identical twins that appear asymmetrically on opposite sides as if they are looking in a mirror. Mirror-image anisometropia in monozygotic twins was previously reported in the ophthalmic literature. In this article, we describe a case of mirror-image hypermetropic anisometropia in siblings aged 8 and 5 years old. Nontwin brothers, 8 and 5 years old, with mirror-image hypermetropic anisometropia, were referred to the pediatric ophthalmology clinic. Corrected distant visual acuity was 20/20 (ocula dextra [OD]), 20/60 (ocula sinistra [OS]) in the older brother, and 20/50 (OD), 20/20 (OS) in the younger brother. Cycloplegic refraction was +3.5 – 1.25 × 180 (OD), +7.75 – 1.5 × 30 (OS), and +7.0 – 0.75 × 20 (OD), +2.0 – 1.0 × 170 (OS) in the older and younger brother, respectively. The axial length difference between the two eyes was 1.47 mm in the older and 2.01 mm in the younger brother. Hypermetropic anisometropia that may lead to anisometropic amblyopia may happen in nontwin brothers. This emphasizes the importance of complete ophthalmologic examination in the siblings of all patients with anisometropia.

Keywords:

Hypermetropic anisometropia, mirror-image, nontwin brothers

Introduction

Mirror-image means matching reflections in two persons when facing each other. This term is generally used for monozygotic twins. They have the same but opposite characteristics, such as dominant handedness, dental structures, or ocular manifestations.^[1] Mirror image anisometropia was previously reported in monozygotic twins.^[1-4] One study also reported this phenomenon in nontwin siblings.^[5] This article presents the first case of nontwin brothers with mirror-image hypermetropic anisometropia.

Case Report

Two brothers were referred to the ophthalmologist for evaluation of amblyopia

treatment. Glasses were previously prescribed for both patients. Their parents were third-degree relatives (first cousins) with no refractive errors. Complete ophthalmic examination, including visual acuity, ocular motility testing, cycloplegic refraction, slit-lamp examination, and dilated fundus examination, was done for them. Cycloplegic refraction was assessed by a Topcon RM-800 auto refractometer (Topcon Medical System, Japan) 30 min after the instillation of two drops of cyclopentolate hydrochloride 5 min apart. Keratometry and axial length were measured with an intraocular lens Master 700 (Carl Zeiss Meditec AG, Jena, Germany).

A full ophthalmic examination revealed “mirror-image hypermetropic anisometropia” in them. The older brother was 8 years old. His right eye’s corrected distant visual acuity was 20/20, and his left eye was 20/60. Cycloplegic

How to cite this article: Farvardin H, Shamsi A, Farvardin M. Case report: Mirror-image hypermetropic anisometropia in nontwin brothers. *Oman J Ophthalmol* 2023;16:558-60.

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: WKHLRPMedknow_reprints@wolterskluwer.com

¹Department of Ophthalmology, Poostchi Ophthalmology Research Center, School of Medicine, Shiraz University of Medical Sciences, Iran, ²Department of Ophthalmology, School of Medicine, Shiraz University of Medical Sciences, Shiraz, Iran, ³Department of Ophthalmology, Clinical Research Development Unit, Shafa Hospital, Kerman University of Medical Sciences, Kerman, Iran

Address for correspondence:

Prof. Majid Farvardin, Poostchi Ophthalmology Research Center, Zand Avenue, Shiraz, Iran. E-mail: majidfarvardinjah.romi@gmail.com

Submitted: 12-Mar-2023

Revised: 19-Jul-2023

Accepted: 20-Jul-2023

Published: 18-Oct-2023

refraction was $+3.5 - 1.25 \times 180$ in the right eye and $+7.75 - 1.5 \times 30$ in the left eye. The younger brother was 5 years old. His visual acuity was 20/50 in the right eye and 20/20 in the left eye. Cycloplegic refraction was $+7.0 - 0.75 \times 20$ in the right eye and $+2.0 - 1 \times 170$ in the left eye. Keratometry and axial length are shown in Table 1. Ocular movements were normal, and no ocular deviation was detected in either of the patients. Slit-lamp biomicroscopy and dilated fundus examination revealed no abnormality. Amblyopia treatment, previously started for them, was continued with part-time patching.

Discussion

It was previously shown that genetics greatly contributes to refractive errors in the human population.^[6] Hammond *et al.*, in their large twin eye study on 226 monozygotic and 280 dizygotic twins, reported high heritability for myopia and hyperopia as discrete traits (90% and 89%, respectively).^[7] Estimates for the heritability of axial length, which is the largest contributor to refractive error, range from 40% to 94%.^[6] Fewer genetic research has investigated the role of the genetic component in hypermetropia. A study on 100 hyperopic patients found no specific familial pattern for their refractive error. However, 30% of the enrolled patients had a positive family history of hyperopia in first-degree relatives.^[8] Different sampling and analytic methods have led to a wide variability in the reported rates of heritability of refractive errors in twin studies. Furthermore, it is important to remember that classical twin studies assume a great match of environmental influences for all twins, leading to an overestimation of heritability.^[9]

The “Mirror-image” phenomenon is generally a term used in identical twins. This term describes a reverse phenotypic difference between individuals’ right and left sides, such as opposite-handedness, facial asymmetry, or other physical characteristics.^[4] This phenomenon can approximately be found in 25% of monozygotic twins. However, few cases of mirror image have been previously reported in the ophthalmic literature. Mirror-image myopic

anisometropia and hypermetropic anisometropia were previously reported in five pairs of identical twins.^[1-4] The mirror image in identical twins occurs when a fertilized egg splits later than normal, around days 9–12.^[1] Yet, no clear reason for the mirror-image phenomenon in nonidentical twins and siblings is suggested.

Park *et al.* reported a case of mirror-image anisometropic myopia in nontwin siblings. The cycloplegic refraction was $-12.50 + 4.0 \times 80^\circ$ (right eye), $-4.50 + 0.75 \times 90^\circ$ (left eye) in the girl, and $-5.00 + 3.50 \times 95^\circ$ (right eye), $-11.50 + 4.00 \times 85^\circ$ (left eye) in the boy. The axial length difference was 1.52 mm in the sister and 1.91 mm in the brother. They concluded that severe myopic anisometropia might be related to genetic inheritance. So far, this is the only mirror-image ocular manifestation report in nontwin siblings.^[5] Yang *et al.* reported mirror images of condylar hyperplasia, malocclusion of teeth, and midline shift of the mandible in two nontwin brothers. After discovering a similar abnormality in their father, they concluded that mandibular condylar hyperplasia could be genetic in origin, possibly Y-linked or autosomal dominant.^[10]

In our case report, we reported mirror-image hypermetropic anisometropia in nontwin brothers. Anisometropia had also led to mirror-image amblyopia in these brothers. The axial length difference was 1.47 mm in the older brother and 2.01 mm in the younger brother. The difference in axial lengths between the eyes had been the causative factor. There are some differences between our case report and the one previously reported by Parks *et al.* The siblings in our study were two brothers, but in Parks *et al.*’s study, there were one brother and one sister. The siblings in our study had hypermetropic anisometropia compared with myopic anisometropia in Parks *et al.*’s study.^[5] To the best of our knowledge, this is the first report of mirror-image hypermetropic anisometropia in nontwin siblings. Further genetic investigations of refractive anomalies and mirror-imaging in identical twins and nontwin siblings might lead to a better understanding of the pathophysiology of refractive errors. Detection of possible genetic predispositions

Table 1: Mirror-image details in nontwin brothers

	8-year-old brother		5-year-old brother	
	OD	OS	OD	OS
BCVA	20/20	20/60	20/50	20/20
FCR	$+3.50 - 1.25 \times 180^\circ$	$+7.75 - 1.50 \times 30^\circ$	$+7.0 - 0.75 \times 20^\circ$	$+2.0 - 1.0 \times 170^\circ$
AL (mm)	22.20	20.73	20.40	22.41
Mean K (D)	43.84	43.34	43.79	43.64
K1 (D)	$42.99 \times 5^\circ$	$42.45 \times 23^\circ$	$42.94 \times 7^\circ$	$43.05 \times 148^\circ$
K2 (D)	$44.7 \times 95^\circ$	$44.23 \times 13^\circ$	$44.64 \times 97^\circ$	$44.23 \times 58^\circ$

OD: Ocula dextra, OS: Ocula sinistra, BCVA: Best-corrected visual acuity, FCR: Full cycloplegic refraction, AL: Axial length

for developing severe refractive errors may also lead to efficient screening program designs in the future.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the legal guardian has given their consent for images and other clinical information to be reported in the journal. The guardian understands that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Acknowledgments

We would like to thank all participants of the study and the Shiraz University of Medical Sciences (Shiraz, Iran).

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Kim WK, Chung SA, Lee JB. Two cases of mirror-image eye anomalies in monozygotic twins. *Korean J Ophthalmol* 2010;24:314-7.
2. Okamoto F, Nonoyama T, Hommura S. Mirror image myopic anisometropia in two pairs of monozygotic twins. *Ophthalmologica* 2001;215:435-8.
3. Stanković-Babić G, Vujanović M, Cekić S. Identical twins with "mirror image" anisometropia and esotropia. *Srp Arh Celok Lek* 2011;139:661-5.
4. Farvardin H, Maalagh M, Farvardin M. Mirror image hypermetropic anisometropia in a pair of monozygotic twins. *J AAPOS* 2019;23:113-5.
5. Park SJ, Kim JY, Baek SH, Kim ES, Kim US. One sister and brother with mirror image myopic anisometropia. *Korean J Ophthalmol* 2010;24:62-4.
6. Young TL, Metlapally R, Shay AE. Complex trait genetics of refractive error. *Arch Ophthalmol* 2007;125:38-48.
7. Hammond CJ, Snieder H, Gilbert CE, Spector TD. Genes and environment in refractive error: The twin eye study. *Invest Ophthalmol Vis Sci* 2001;42:1232-6.
8. Bajwa JA, Iqbal I. Study of familial pattern in patients with hyperopia. *Adv Ophthalmol Visual Syst* 2018;8:129-131.
9. Harb EN, Wildsoet CF. Origins of refractive errors: Environmental and genetic factors. *Annu Rev Vis Sci* 2019;5:47-72.
10. Yang J, Lignelli JL, Ruprecht A. Mirror image condylar hyperplasia in two siblings. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2004;97:281-5.