

Myopic fundus changes in adult-onset moderate myopia

Rafael Iribarren MD^a, María Marta Galán MD^b, Jos Rozema PhD^{c-d}

^a *Drs. Iribarren Eye Consultants, Buenos Aires, Argentina.*

^b *Children's Hospital Ophthalmology Department, La Plata, Argentina.*

^c *Visual Optics Lab Antwerp (VOLANTIS), Faculty of Medicine and Health Sciences, Antwerp University, Wilrijk, Belgium.*

^d *Department of Ophthalmology, Antwerp University Hospital, Edegem, Belgium.*

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Corresponding author

Dr. Rafael Iribarren

Drs. Iribarren Eye Consultants

Arenales 981

C1061AAE, Buenos Aires, Argentina

+54-911-5147-9312

rafairbarren@gmail.com

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Abstract

Purpose: To show a case of adult-onset moderate myopia that developed myopic maculopathy in both eyes. This report shows that an individual with moderate myopia can still develop myopic maculopathy because of a combination of a long axial length and a low lens power that produces a lower-than-expected myopic refraction.

Case report: A 67-year-old man came for first time visit seeking vision exam in 2021 with moderate myopia. He reported having good distance and near vision in his youth but then by age 30 he began to experience impaired distance vision. He was initially given a prescription for low astigmatism for his right eye, but his distance vision slowly degraded to the point where he needed higher powered spectacles as years passed. His refractive error in 2021 was -3.25D, -2.00 D 90° (OD) and -3.25D (OS) with a best corrected visual acuity of 20/30 (OD) and 20/20 (OS). His ocular biometry showed an eye that was longer than usual with an almost normal cornea and a low-powered crystalline lens. In both eyes, the fundus showed typical myopic degenerations mainly peripapillary atrophy. The examination after pupil dilation showed mild nuclear opacity grade 1 (LOCS III) bilaterally, with no cortical or subcapsular opacities.

Conclusions: This adult-onset moderate myopic subject probably developed myopic maculopathy because his eye was longer than usual during emmetropization due to a low powered crystalline lens.

Key words: myopic maculopathy, moderate myopia, ocular biometry, axial length.

Cambios del fondo de ojo en miopía moderada del adulto

Resumen

Objetivo: Mostrar un caso de miopía moderada de inicio en la vida adulta que desarrolló maculopatía miópica en ambos ojos. Este informe muestra que una persona con miopía moderada aún puede desarrollar maculopatía miópica debido a una combinación de una longitud axial larga y un cristalino de baja potencia que produce una refracción miópica inferior a la esperada para dicho largo axial.

Informe del caso: Hombre de 67 años acudió por primera vez en busca de un examen visual en 2021 con miopía moderada. Informó que tenía buena visión de lejos y de cerca en su juventud, pero luego, a los 30 años, comenzó a tener problemas de visión de lejos. Inicialmente se le prescribió un astigmatismo bajo para su ojo derecho, pero su visión de lejos se degradó lentamente hasta el punto en que necesitaba anteojos de mayor potencia a medida que pasaban los años. Su error refractivo en 2021 fue de -3,25 D, -2,00 D a 90° (OD) y -3,25 D (OS) con una agudeza visual mejor corregida de 20/30 (OD) y 20/20 (OS). Su biometría ocular mostró un ojo más largo de lo habitual con una córnea casi normal y un cristalino de bajo poder. En ambos ojos, el fondo de ojo mostraba degeneraciones miópicas típicas, principalmente atrofia peripapilar. La exploración tras dilatación pupilar mostró opacidad nuclear leve grado 1 (LOCS III) bilateral sin opacidades corticales ni subcapsulares.

Conclusiones: Este sujeto con miopía moderada de inicio en la edad adulta probablemente desarrolló maculopatía miópica porque su ojo era más largo de lo normal durante la emetropización debido a un cristalino de baja potencia.

Palabras clave: maculopatía miópica, miopía moderada, biometría ocular, largo axial.

Alterações do fundo de olho na miopia moderada do adulto

Resumo

Objetivo: Mostrar um caso de miopia moderada com início na vida adulta que desenvolveu macu-

lopatia míope em ambos os olhos. Este relatório mostra que uma pessoa com miopia moderada ainda pode desenvolver maculopatia miópica devido a uma combinação de um comprimento axial longo e uma lente de baixa potência que produz uma refração miópica menor do que o esperado para esse comprimento axial.

Relato de Caso: Homem de 67 anos apresentou-se pela primeira vez para exame oftalmológico em 2021 com miopia moderada. Ele relatou ter boa visão de longe e de perto em sua juventude, mas depois, aos 30 anos, começou a ter problemas de visão de longe. Ele foi inicialmente prescrito para baixo astigmatismo para o olho direito, mas sua visão de longe se degradou lentamente a ponto de precisar de óculos de maior potência com o passar dos anos. Seu erro refrativo em 2021 foi de -3,25 D, -2,00 D a 90° (OD) e -3,25 D (OS) com melhor acuidade visual corrigida de 20/30 (OD) e 20/20 (OS). Sua biometria ocular mostrou um olho mais longo que o normal com uma córnea quase normal e uma lente de baixa potência. Em ambos os olhos, o fundo de olho apresentava degenerações míopes típicas, principalmente atrofia peripapilar. O exame após dilatação pupilar mostrou opacidade nuclear leve grau 1 bilateral (LOCS III) sem opacidades corticais ou subcapsulares.

Conclusões: Este sujeito com miopia moderada de início na idade adulta provavelmente desenvolveu maculopatia míope porque seu olho era mais longo do que o normal durante a emetropização devido a uma lente de baixa potência.

Palavras-chave: maculopatia míope, miopia moderada, biometria ocular, comprimento axial.

Introduction

Myopia is generally a progressive eye disease with typical onset during the primary school years. But as myopia can progress even beyond the age of 25 years, planning for such a long follow up is a problem when designing prospective studies. Some studies reported the age of first spectacle prescription and progression of myopia up to adult years. One of these studies in a low myopia prevalence country (Argentina, 14% prevalence of myopia) showed that a proportion

Table 1. Mean ocular components of both eyes.

Component	Unit	OD	OS
Spherical equivalent	diopters	-4.25	-3.25
Vertical keratometry	diopters	42.11	43.14
Horizontal keratometry	diopters	42.84	42.49
Anterior chamber depth	millimeters	3.42	3.38
Lens thickness	millimeters	4.95	4.88
Anterior segment length	millimeters	8.37	8.26
Axial length	millimeters	26.81	26.29
Crystalline lens power	diopters	19.33	19.06

of the myopic cases found in adults aged 30-50 years had their onset in young adulthood. In general, most adult-onset myopes retain low myopia and are not prone to myopic maculopathy.

Patients who progress beyond -5D of spherical equivalent are at risk of developing myopic maculopathy (i.e., producing permanent scularae leading to impaired vision). In terms of axial length, the increased risk of developing myopic maculopathy begins at > 25.9 mm in men and > 25.3 mm in women. Since Sorsby's studies in 1950's it is known that emmetropic eyes with flatter corneas or low powered crystalline lenses have longer axial lengths. This is also true for eyes that later develop myopia as the correlation between corneal power and axial length is established by an active emmetropization process based on retinal defocus in the first years of life, that would make an eye with flatter refractive surfaces grow longer. This process is independent from myopization, which generally develops after age 6 when the emmetropization process should have concluded. Although in children under 12 years myopia development goes accompanied with an accelerated lens power loss, as if trying to compensate the environmentally driven excess in axial elongation, this cannot prevent myopia from occurring. Consequently, there will be adult

myopes with flat corneas and low-powered lenses. This work presents the details of such a case.

Case details

A 67-year-old man with moderate myopia presented himself at our office in 2021 for a routine ocular exam. He remembered having good distance and near vision since his youth and had no problems with obtaining driving license at age 18 years (in Argentina best corrected or uncorrected 20/30 distance visual acuity is required to drive a car). At 30 years of age, his distance vision slowly deteriorated, and he was diagnosed with myopia and astigmatism. Although almost 37 years had passed, he remembered having a first prescription for low astigmatism for his right eye. Over time he had to change his spectacle prescription to compensate his slowly degrading distance vision, but he never needed spectacles for near vision.

Concerning myopia risk factors, he studied and worked as a public accountant, and was an avid reader for both work and pleasure for his whole life. On weekdays, he spent his time indoors, while weekends were spent outdoors playing football with friends staying in a local club for 6 hours on Saturdays and Sundays until today.

At the moment of first presentation (2021 first visit), his objective refractive error was -3.25D, -2.00 D 90° (OD) and -3.25D (OS) with a best corrected visual acuity of 20/30 (OD) and 20/20 (OS). His ocular biometry parameters are given in Table 1. Crystalline lens power was calculated based on distance refraction and biometry with Bennett's equation. The patient was seen until different studies were performed to arrive at a correct diagnosis. In both eyes, the fundus showed typical myopic degenerations, mainly peripapillary atrophy in both eyes (Fig. 1). His macular OCT images showed normal foveal areas. He was exophoric for distance and near vision with convergence insufficiency and remembered having done orthoptic treatment for many years with some interruptions. His IOP was 16 mmHg in both eyes. The examination after pupil dilation showed nuclear opacity grade 1 (LOCS III) bilaterally, with no cortical or subcapsular opacities.

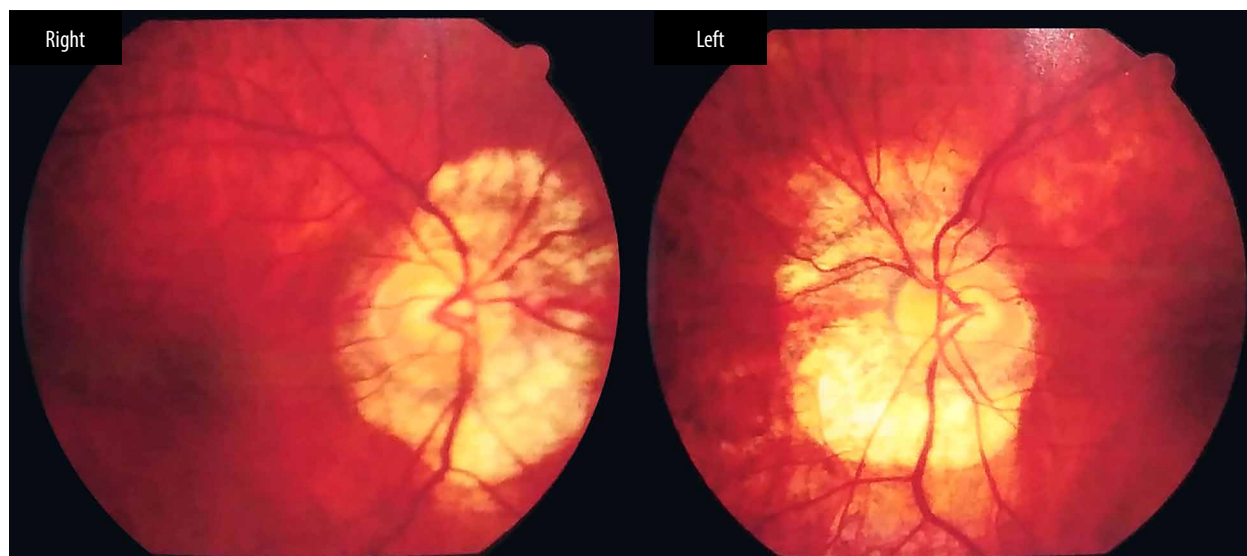


Figure 1. Fundus photographs showing myopic peripapillary atrophy in both eyes.

Discussion

Although this case did not have a prospective follow-up, it shows several interesting aspects of late-stage refractive development. The patient's progressive myopia began at 30 years in an eye with a mean keratometry of 42.47D and a crystalline lens power of 19D, both of which are lower than normal reported values (43.5D and 22D, respectively). Assuming no influence by the mild nuclear opacity, his -3D myopic shift could only have occurred from either a highly unlikely increase in corneal or lenticular power, or the gradual axial growth of his eye from an estimated value of 25.80 mm at 30 years to the current value of 26.81 mm. Hence, this case report suggests that axial elongation is possible after the age of 30 years.

The second important issue is the development of myopic fundus changes in an eye with a refractive error less than -6D. This case illustrates the importance of the axial length in this context, which connects with the suggestion by Galan *et al.* that, besides axial length, the corneal and lens powers have to be taken on account in small children with developing myopia to prevent possible macular complications later in adulthood. A 6-year-old myopic child with a flat cornea or a

low-powered lens may therefore already have an eye of 25 mm long that will still experience about 1 mm of normal growth, even if the environmental triggers for myopia are removed. Given that most eyes are born with an axial length of 17 ± 1 mm, and that the retina is not believed to grow after birth, axial elongations over 25 mm will put an extraordinary amount of stress on the retina, causing it to tear away from the optic nervehead and leading to myopic retinopathy. An excessive axial length is therefore much more likely to produce the macular changes observed in myopic long eyes than their actual spherical equivalent, whether they are above or below -6D.

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