



ORIGINAL ARTICLE

Under-correction of human myopia – Is it myopigenic?: A retrospective analysis of clinical refraction data



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KEYWORDS

Myopia;
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Near-work

Abstract

Purpose: To investigate retrospectively, based on routine clinical records in an optometric office, the effect of refractive under-correction of the myopic spectacle prescription on myopic progression in children and young adults.

Methods: Patient records of children and young-adult myopes in a private optometric practice in Glendale, Arizona, USA, were initially reviewed to identify those that met the criteria. Information collected from the patient records included: age, gender, the dates and number of their visits (more than one visit was required for use of the data), final prescription, and non-cycloplegic subjective refraction. For each patient visit, the difference in spherical equivalent (SE) between the subjective refraction for maximum visual acuity and the final prescription was calculated for both the left and right eyes. Myopia progression was defined as the difference in SE between the final subjective refraction of the previous visit and that of the subsequent visit. Based on the study criteria, a total of 275 patient visits were obtained from the data collected in 76 patients.

Results: A significant positive correlation was found between the magnitude of under-correction of the refractive error and myopic progression ($r=0.301$, $p<0.01$); that is, the greater the under-correction, the greater the myopic progression. In addition, there was a significant positive correlation between myopia progression and subjective refraction ($r=0.166$, $p=0.006$); that is, the greater the degree of myopia, the greater the effect of under-correction. However, there was no significant correlation between myopia progression and either age ($r=-0.11$, $p=0.86$) or gender ($r=-0.82$, $p=0.17$).

Conclusion: Under-correction of myopia produced a small but progressively greater degree of myopic progression than did full correction. The present finding is consistent with earlier clinical trials and modeling of human myopia.

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PALABRAS CLAVE

Miopía;
Corrección
insuficiente;
Acomodación;
Desenfoque
retiniano;
Trabajo de cerca

Corrección insuficiente de la miopía humana - ¿Es miopigénica?: Análisis retrospectivo de datos sobre refracción clínica

Resumen

Objetivo: Investigar retrospectivamente, basándonos en las historias clínicas rutinarias en un centro optométrico, el efecto de la corrección refractiva insuficiente de la prescripción de gafas para miopía sobre la progresión de esta patología en niños y jóvenes adultos.

Métodos: Se revisaron inicialmente las historias clínicas de niños y jóvenes adultos miopes en un centro optométrico privado de Glendale, Arizona, EEUU, para identificar quiénes cumplían los criterios. La información obtenida de las historias de los pacientes incluyó: edad, sexo, fechas y número de visitas (se requirió más de una visita para poder utilizar la información), prescripción final, y refracción subjetiva no ciclopléjica. Se calculó para cada paciente la diferencia del equivalente esférico (EE) entre la refracción subjetiva para la agudeza visual máxima y la prescripción final, para el ojo derecho y el izquierdo. La progresión de la miopía se definió como la diferencia de EE entre la refracción subjetiva final de la visita anterior y la de la visita siguiente. Basándonos en los criterios de estudio, se obtuvo un total de 275 visitas de pacientes de la información recogida de 76 pacientes.

Resultados: Se halló una correlación positiva considerable entre la magnitud de corrección insuficiente del error refractivo y la progresión de la miopía ($r=0,301$, $p<0,01$); es decir, cuanto mayor era la insuficiencia de la corrección, mayor era la progresión de la miopía. Además, existía una correlación positiva significativa entre la progresión de la miopía y la refracción subjetiva ($r=0,166$, $p=0,006$); es decir, cuanto mayor era el grado de miopía, mayor era el efecto de la corrección insuficiente. Sin embargo, no existió correlación significativa entre la progresión de la miopía y la edad ($r=-0,11$, $p=0,86$) o el sexo ($r=-0,82$, $p=0,17$).

Conclusión: La corrección insuficiente de la miopía produjo un pequeño aunque progresivamente mayor grado de progresión de la miopía que la corrección total. El presente hallazgo es consistente con estudios clínicos anteriores y la modelación de la miopía humana.

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Introduction

Myopia is an international public health problem. It was estimated to have a prevalence of approximately 25 percent in the U.S. Caucasian adult population¹ between the years of 1971–1972. Notably, between the years of 1999–2004, this increased significantly to approximately 42 percent.² In Asian countries like Japan, there is yet a higher prevalence of myopia (as high as 66%) among the young-adult population.³ Furthermore, recent studies (e.g., Saw et al.,⁴) have reported that there is an even greater prevalence of myopia in Asian countries with increasing age, with it ranging from 4 percent by 6 years of age, and to 40 percent by 12 years of age, with a further increase to 75 percent or more by 18 years of age.

Various methods have been employed in an attempt to reduce the progression of myopia.^{4–7} Spectacles, contact lenses, atropine, and refractive surgery are the primary current options to treat and/or remediate myopia.^{8,9} For example, the use of plus-powered spectacles when performing near work may provide some degree of success by reducing the chronic amount of potentially myopiogenic retinal defocus,¹⁰ and furthermore by reducing the blur-driven accommodative magnitude.¹¹ In some studies, bifocal and progressive addition spectacle lenses (PALs) have demonstrated significant differences in reducing the progression of myopia,¹² whereas others have not.¹³ Lastly, and more recently, studies on children have demonstrated that orthokeratology and bifocal contact lenses may arrest

myopic development to some extent.^{8,9,13,14} Thus, this remains an active area of investigation.

Under-correction of the myopic spectacle correction has been discussed in the literature from the mid-1850s (see Curtin⁵ for a review). While the rationale for prescribing modest myopic under-correction is somewhat vague, it was believed to represent an attempt to reduce the accommodative stimulus and demand at near,⁷ and thus reduce the blur drive for accommodation, with the related biomechanical aspects of accommodation per se at near (e.g., mechanical stress at the posterior pole) thought to be a myopiogenic factor. However, the results have been equivocal.^{5–7} It may also represent the near lens which ‘‘balances’’ the accommodative and vergence systems.¹¹

Thus, the purpose of the present investigation was to determine retrospectively, based on clinical optometric records, the effect of refractive under-correction of myopic spectacle prescription and its influence on myopic progression in a clinical population of children and young-adult myopes.

Methods

The present study was designed to collect data in myopic patients from a private optometric practice in Glendale, Arizona, USA. All records used in this investigation belonged to one optometrist who had examined the majority of the patients at each visit over a period of 6–8 years.

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