



ORIGINAL ARTICLE

Immediate effect of a tear enhancer and meibomian gland expression on the corneal surface and whole eye higher order aberrations

Giancarlo Montani^{a,*}, Paul J. Murphy^{b,c}, Sudi Patel^d

^a School of Optics and Optometry, University of Salento, Lecce, Italy

^b School of Optometry and Vision Science, University of Waterloo, Canada

^c School of Optometry and Vision Sciences, Cardiff, UK

^d NHS National Services Scotland, Edinburgh, UK & Svjetlost University Eye Hospital, Zagreb, Croatia

Received 27 December 2016; accepted 20 January 2018

KEYWORDS

High order aberrations;
Tears;
Tears enhancer;
Meibomian gland expression

Abstract

Purpose: To investigate changes in higher order ocular aberrations (HOA) induced by the administration of 0.15% sodium hyaluronate tear enhancer (TE) and meibomian gland expression (ME) on the tear film of normal subjects.

Methods: HOA values were obtained from the corneal surface (CS) and whole eye (WE), using a corneal topographer and Shack–Hartmann aberrometer, from both eyes of 50 subjects (25 females, mean age \pm sd 32.5 ± 11.0 years, and 25 males, 33.88 ± 11.2 years) for two pupil sizes (3 and 6 mm) in a dark environment. One drop of Blink ContactsTM (Abbott Medical Optics) was instilled into the right eye and HOA measurements repeated after 30 s. After 1 h, the meibomian glands of the left lower eyelid were gently squeezed and HOA measurements repeated after 30 s.

Results: There was no significant difference for CS and WE root mean square (RMS) HOAs between right and left eyes before (both pupil sizes) and after TE use or ME (3 mm pupil). For 6 mm pupil, TE use significantly reduced the WE RMS HOA ($p < 0.05$, mean \pm sd) for Z_4^0 (0.297 ± 0.136 to 0.053 ± 0.069), and Z_5^5 (0.221 ± 0.372 to 0.098 ± 0.121) while ME significantly increased CS RMS HOA ($p < 0.05$, mean \pm sd) for Z_3^{-3} (0.799 ± 1.178 to 1.302 ± 1.991) and Z_4^4 (0.594 ± 1.184 to 0.988 ± 1.463). In general, the change in HOA was significantly correlated with the initial value before TE use or ME ($p < 0.05$).

Conclusion: There were no detectable differences between right and left eyes. For the 6 mm pupil, the tear enhancer tended to improve optical performance of the WE and meibomian gland expression tended to reduce the optical performance at the CS.

© 2018 Spanish General Council of Optometry. Published by Elsevier España, S.L.U. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

* Corresponding author at: School of Optics and Optometry, University of Salento, Via per Arnesano, 73100 Lecce, Italy.
E-mail address: giancarlo.montani@le.infn.it (G. Montani).

<https://doi.org/10.1016/j.optom.2018.01.004>

1888-4296/© 2018 Spanish General Council of Optometry. Published by Elsevier España, S.L.U. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

PALABRAS CLAVE

Aberraciones de alto orden;
Lágrimas;
Lágrimas artificiales;
Expresión de las glándulas de Meibomio

Efecto inmediato de las lágrimas artificiales y de la expresión de las glándulas de Meibomio sobre las aberraciones de alto orden de la superficie corneal y totales

Resumen

Objetivo: Estudiar los cambios de las aberraciones oculares de alto orden (HOA) inducidas por la aplicación de las lágrimas artificiales con 0,15% de hialuronato sódico y la expresión de las glándulas de Meibomio (ME) en la película lagrimal en sujetos normales.

Métodos: Se obtuvieron los valores de HOA de la superficie corneal (SC) y de la totalidad del ojo, utilizando un topógrafo corneal y un aberrómetro Shack-Hartmann, de ambos ojos de 50 sujetos (25 mujeres, edad media \pm DE 32,5 \pm 11 años, y 25 varones, 33,88 \pm 11,2 años) para dos tamaños de pupila (3 y 6 mm) en un entorno oscuro. Se instiló una gota de Blink Contacts™ (Abbott Medical Optics) en el ojo derecho, repitiéndose las mediciones de HOA transcurridos 30 segundos. Al cabo de 1 hora, se presionaron suavemente las glándulas de Meibomio del párpado inferior del ojo izquierdo y se repitieron las mediciones de HOA al cabo de 30 segundos.

Resultados: No se produjo diferencia significativa en el error cuadrático medio (RMS) de HOA de la superficie corneal y la totalidad del ojo entre los ojos derecho e izquierdo (ambos tamaños de pupila) antes o después del uso de las lágrimas artificiales o ME (pupila de 3 mm). Para pupilas de 6 mm, el uso de lágrimas artificiales redujo significativamente el RMS de HOA de la totalidad del ojo ($p < 0,05$, media \pm DE) para Z^0_4 (de 0,297 \pm 0,136 a 0,053 \pm 0,069), y Z^5_5 (de 0,221 \pm 0,372 a 0,098 \pm 0,121) mientras que ME incrementó significativamente el RMS de HOA ($p < 0,05$, media \pm DE) para Z^{-3}_3 (de 0,799 \pm 1,178 a 1,302 \pm 1,991) y Z^4_4 (de 0,594 \pm 1,184 a 0,988 \pm 1,463). En general, el cambio de HOA guardó una correlación significativa con el valor inicial antes del uso de lágrimas artificiales o ME ($p < 0,05$).

Conclusión: No se observaron diferencias detectables entre los ojos derecho e izquierdo. Para la pupila de 6 mm, la lágrima artificial tendió a mejorar el rendimiento óptico de la totalidad del ojo, y la expresión de las glándulas de Meibomio tendió a reducir el rendimiento óptico de la superficie corneal.

© 2018 Spanish General Council of Optometry. Publicado por Elsevier España, S.L.U. Este es un artículo Open Access bajo la licencia CC BY-NC-ND (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Introduction

The quality and dimensions of the overlying tear film before, during, and after a blink influence the overall optical properties of the eye described by the higher order aberrations.¹⁻⁶ Perturbations in the tear film leading to alterations in the propagation of light are expected to impact on the overall refractive properties of the tear film and, in turn, affect the overall quality of the retinal image. The effect of these perturbations is enhanced by the non-uniform distribution of lipid and aqueous layers, and by the difference in refractive index between them; lipid layer: 1.482, with a range of 1.460–1.530⁷ at a typical corneal surface temperature, and aqueous layer: 1.337.^{8,9}

Abnormal tear film quality and structure due to dry eye disease leads to a reduced visual performance.¹⁰⁻¹² Tear enhancers are intended to provide both relief from symptoms of dry eye and improve the stability of the tear film with a better quality of vision. These effects can also be produced by expressing meibomian oil from the lower eyelid by digital manipulation of the tarsal glands.^{13,14} Many patients report fluctuating and blurred vision immediately after tear enhancer instillation, or after meibomian oil expression. The visual disturbance can persist for many seconds before the quality of vision settles. Though such remarks are

anecdotal, the patients are describing a persistent inconvenient symptom.

Considering the interruption in the optical quality of the eye, it would be useful to ascertain if any particular aberrations are more affected by deliberate shifts in the content and quality of the tear film. Using higher order aberration (HOA) analysis, it is possible to investigate whether specific numerical indices associated with the optical quality of the eye are more sensitive to changes related to the tear film.

The aim of this study was to determine if certain higher order aberrations observed from the corneal surface are related to: irregularities within and over the tear film, and whole eye; the quality of the retinal image quality; and are more susceptible to change shortly after instilling a tear enhancer or meibomian expression in normal subjects.

Methods and materials

Subjects

To avoid artefacts induced by a baseline of poor tear film stability attributable to dry eye, 50 subjects (mean age \pm sd: 33.2 \pm 11.0 years), 25 females (range 19–60 years) and 25 males (range 18–56 years), with a normal tear film,

Download English Version:

<https://daneshyari.com/en/article/10211486>

Download Persian Version:

<https://daneshyari.com/article/10211486>

[Daneshyari.com](https://daneshyari.com)