COETF REPORT
RAPPORT DU FFOCÉ

In an effort to highlight some of the projects and research by COETF award recipients, the COETF Trustees and Awards Committee have selected project reports to be published in the Canadian Journal of Optometry · Revue canadienne des optométristes. Recognizing that many recipients intend to publish their work in cited journals, the reports are not considered to be clinical articles. COETF funded research, when completed and peer reviewed, may be published in CJO·RCO and other journals. The COETF reports are intended to provide relevant information for the benefit of our readers and to showcase the high caliber of optometric research funded by COETF, Canadian optometry's national charity.

Biomechanical alteration of corneal morphology after Corneal Refractive Therapy

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Summary: Moldability of the Ocular Surface in Response to Local Mechanical Stress

The purpose of this study is to determine the moldability of the ocular surface by examining the acute effects of local mechanical stress on optical performance, corneal shape and corneal/epithelial thickness after corneal refractive therapy for myopia and hyperopia (CRT® and CRT®H).

Twenty ametropes (spherical equivalent: -2.08 ± 2.31D) wore CRT® and CRT®H lenses in a random order on one eye (randomly selected). The lenses were worn for three separate time periods of 15 minutes, 30 minutes and one hour (randomly ordered, with each time period taking place on a separate day). Refractive errors, aberrations, corneal topography, and corneal/epithelial thickness (using OCT) were measured before and after the lens wear. The measurements were performed on the control eyes at the one hour visit only.

With both CRT® and CRT®H lens wear, significant changes occurred in many parameters from the 15 minute time point. Refractive error, total aberration and defocus decreased after CRT® lens wear (all $p<0.05$) and increased after CRT®H lens wear from baseline (all $p<0.05$). Astigmatism did not change (both $p>0.05$). Higher order aberration (HOA) including sperical aberration (SA) and coma, increased after CRT® and CRT®H lens wear (all $p<0.05$) from baseline, but the signed SA shift from positive to negative after CRT®H lens wear ($p<0.05$). The central cornea flattened and the mid-periphery steepened after CRT® lens wear, whereas the central cornea steepened and mid-periphery flattened after CRT®H lens wear ($p<0.05$). The central cornea swelled less than the mid-periphery after the CRT® lens wear ($p<0.05$), whereas the cornea swelled more than the mid-periphery after CRT®H lens wear ($p<0.05$). The central epithelium was thinner than the mid-periphery after CRT® lens wear ($p<0.05$) and thicker than the mid-periphery after CRT®H lens wear ($p<0.05$). Optical performance and corneal curvature did not change from baseline in the control eyes (all $p>0.05$).

In conclusion, CRT® lenses for myopia and hyperopia induce significant structural and optical changes in as little as 15 minutes. The cornea is highly moldable.