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Corneal and Total Aberrations from Childhood to Adulthood

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Abstract

Purpose: To investigate monochromatic optical aberrations of the cornea and the whole eye in children, teenagers and young adults.**Methods:** Total ocular aberrations were measured with a Hartmann-Shack wavefront sensor following pharmacological dilation and cycloplegia. Corneal aberrations were obtained from Orbscan (Bausch & Lomb Surgical) elevation maps of the anterior corneal surface. Aberrations for the internal optics were computed as the difference between total and corneal aberrations. Wavefront aberrations were expressed as Zernike polynomial expansions and the Root Mean Square wavefront error (RMS) was used as a parameter of optical quality. Data analysis was carried out for a 5mm pupil. Twenty six subjects with a spherical equivalent ranging from -3.00D to 1.00D (mean: $-0.54 \pm \text{SEM } 0.20\text{D}$) and a corrected visual acuity of 20/25 or better were enrolled. The mean age was $17.10 \pm \text{SEM } 1.5$ years (range: 5.75 to 30.81).**Results:** The mean RMS values (for 3rd order terms and higher) corresponding to corneal aberrations were 0.482 ± 0.055 micron for children (less than 10 years; n=7), 0.510 ± 0.033 micron for teenagers (from 1 to 19 years; n= 9), and 0.426 ± 0.037 micron for young adults (20 years and over; n= 10). These values were significantly larger than those of the whole eye: 0.256 ± 0.021 micron for children (p=0.006), 0.321 ± 0.031 micron for teenagers (p=0.038), and 0.275 ± 0.031 micron for young adults (p=0.004). Inter-subject variability was also larger for corneal data. Spherical aberrations (term 12) and coma-like terms (7 and 8) were also found to be higher for the cornea than for the whole eye.

Conclusions:

In the three studied groups, total aberrations were lower than those of the cornea, which implies that the

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internal optics partially compensated for corneal aberrations, from childhood to early adulthood.

Keywords: physiological optics • refractive error development



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