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ARTICLE · JULY 2014

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Central corneal thickness of healthy Saudi children
Haya Al Farhan, Waad Albaow, Wagiha Masoud

Introduction
It is essential that the central corneal thickness (CCT) of healthy children without glaucoma is determined for each age and race. The CCT is important in the diagnosis and treatment of pathological myopia, keratoconus, ocular hypertension, and open-angle glaucoma [1–3]. Numerous studies of CCT measurements among adults have detected a significant racial difference among different ethnic groups [4,5].

The development of new noncontact specular microscopes such as the Nidek CEM 530 specular microscope has facilitated the measurement of parameters such as the mean CCT. This microscope enables the determination of the CCT without the risk of corneal epithelial abrasion and infection transmission, which is associated with ultrasound pachymetry, and it is also easy to use in children [6]. Furthermore, a handheld pachymeter can potentially incur errors such as inaccurate placement of the probe obliquely to the corneal surface [7].

A number of studies have measured the CCT of White and African-American [8], Hispanic [8], and Asian [5] children. Hussein et al. [9] reported that the CCT and paracentral corneal thickness were found to increase over time, and reached adult thickness between 5 and 9 years of age. However, Dai and Gunderson [8] found no difference among age groups within the 0–18-year range when these were stratified into groups of less than 2 years, 2–4 years, 5–9 years, and 10–18 years. Rushood et al. [10] reported a CCT of 616 ± 61 μm in full-term Saudi infants. These different findings in different studies are indicative of differences on the basis of ethnicity. To the best of our knowledge, no study has examined the CCT of Saudi children aged 7–12 years. The aim of this study was therefore to determine the CCT of healthy Saudi children aged 7–12 years and to investigate the effects of age and sex on CCT.

Patients and methods
A total of 412 children aged 7–12 years were selected randomly from a school population in Riyadh, Saudi Arabia. Comprehensive anterior segment examinations of all participants were performed using a slit-lamp biomicroscope. Exclusion criteria included dry eye and ocular trauma, a history of ocular surgery or intraocular abnormalities, a family history of a hereditary corneal disorder, increased intraocular pressure, uveitis, corneal opacity, evidence of endothelial dystrophy on slit-lamp biomicroscopy, and any systemic disease, such as diabetes mellitus. Spherical and cylindrical refractions and intraocular pressure were determined by autorefractometry (Auto Kerato–Refracto-Tonometer TRK-1P-Topcon Inc., Tokyo, Japan). One eye was selected randomly from each participant using a table generated in Microsoft

Purpose
The aim of this study was to determine the central corneal thickness (CCT) of healthy Saudi children aged 7–12 years and investigate variations in CCT according to age and sex.

Results
The median CCT among all participants was 576 μm. Regression analysis detected a strong positive correlation between CCT and age (r = 0.64, P < 0.0001), and CCT was found to increase by 8.26 μm each year. The mean CCT of boys was 0.45 μm thicker than that of girls, but this difference was not statistically significant (P = 0.83).

Conclusion
The CCT increased with age from 7 to 12 years, and there was no statistically significant difference in the CCT of boys and girls.

Keywords:
central corneal thickness, Nidek CEM 530 specular microscope, noncontact
had a 0.45 \( \mu \)m thicker mean CCT than girls, but the difference was not statistically significant \((P = 0.83)\).

### Discussion

Numerous studies have reported a decrease in CCT once adulthood is reached [8,9] as well as racial differences in CCT [1,11]. In contrast, a pattern of CCT increase with age has been reported in children [11,12]. Hussein et al. [9] reported a mean increase in CCT with age reaching adult thickness by the age 5 years. As their study only included 18 children older than 10 years of age, there were insufficient numbers of children to conclude whether the trend continued after 9 years. Another study reported no association between CCT and age in children [13]. This might be because of the exclusion criteria as children aged 8 years were excluded and the study sample was too small to detect an effect of age on CCT [8,13]. In Saudi Arabia, this age range represents the base of our population pyramid, and could thus be a benchmark for CCT measurements to improve our understanding of the effects of age and sex on pathogenic conditions of the cornea, such as pathological myopia and keratoconus.

Our finding that the median CCT increased with age (by 8.6 \( \mu \)m annually) supports reports from previous studies [11,12]. Bradfield et al. [11] reported a weak positive correlation between CCT and age \((r = 0.06)\) in White and Hispanic children, with CCT increasing by 1.50 \( \mu \)m annually. Yet, in the case of African-American children, although a weak positive correlation between CCT and age was also detected \((r = 0.10)\), the CCT only increased by 0.80 \( \mu \)m annually. The differences in the annual increase in CCT might be because of racial variations [11,12].

Ethnicity-based differences in CCT have been documented in several studies [1,11]. White and Hispanic children reportedly have a similar CCT, whereas African-American children have a lower CCT across all age groups. In addition, the mean CCT among East Asian children is intermediate between that of White and Hispanic and African-American children. The clinical significance of these racial differences is unknown. Our study indicates that Saudi children have slightly different CCT values compared with White and Hispanic children (Table 3).

Bradfield et al. [11] reported that boys had a 5 \( \mu \)m thicker CCT than girls and that this difference was statistically significant \((P = 0.003)\). However, in our study, no significant difference was found as the mean difference of 0.45 \( \mu \)m was not statistically significant \((P = 0.83)\). The results of this study are supported by...
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The reference percentiles were derived from a regression model of CCT as a function of age [11]; CCT, central corneal thickness; *Each cell contains a CCT value in micrometers.

Acknowledgements

Conflicts of interest
There are no conflicts of interest.

References


