Original Research Article

An observational study of Central Corneal Thickness and Refractive Error

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Abstract

Background: Central corneal thickness (CCT) is an essential tool in the assessment and management of corneal disease. CCT has thus become very important for the interpretation of intraocular pressure and prerefractive procedure assessment; however little is known about its distribution within a population with wide range of refractive errors. **AIM:** To study the correlation of CCT with a broad range of refractive errors in rural population. **Materials and Method:** Prospective analysis of patients with refractive error presenting to the Ophthalmology outpatient services were included as cases. Age and sex matched emmetropic subjects were included as controls. Both cases and controls were undertaken for CCT measurements by ultrasonic pachymetry. **Results:** A total of 187 eyes as cases, 101 as controls. Among cases, 122 eyes myopic (Group- 1) (Mean CCT= 531.80±37.83 µ) and 65 hypermetropic (Group- 2) (Mean CCT=549.66±45.66 µ). The results shows that the central corneal thickness was decreased in the myopic eyes in comparison to the normal eyes which was statistically significantly (p=0.001). However in the hypermetropic group, no correlation was found between central corneal thickness and degree of hypermetropia. **Conclusion:** This study provides pilot data of CCT in different types of refractive errors which helps us in understanding the variation of CCT with refractive errors.

Keywords: Central corneal thickness (CCT), Refractive error

Introduction

Central corneal thickness (CCT) is an important indicator of health status of cornea. It serves as an essential tool in the assessment and management of various corneal diseases.[1] CCT determines the corneal rigidity which consequently impacts the accuracy of intraocular pressure measurement by applanation tonometry. Various studies have shown that thicker corneas with greater rigidity may offer greater resistance to applanation leading to artificially high intraocular pressure.[2-4] With the advent of various corneal refractive procedures, CCT values have gained enormous importance in the pre-operative evaluation of patients, influencing whether or not to perform the surgery, the type of recommended procedure, and the rate of postoperative complications.[5,6] Thus, CCT has become very important for the interpretation of intraocular pressure and pre-refractive procedure assessment. However, little is known about the distribution of CCT in a particular population with wide range of refractive errors. The study was undertaken to determine the correlation of central corneal thickness in the rural population with a broad range of refractive errors.

Materials and Methods

This Prospective was conducted at department of ophthalmology, Sri Krishna Medical College & Hospital, Muzaffarpur. All the samples were randomly selected and the operator was double-blinded for the study. The study was conducted over a period of 12 months time from April 2020 to March 2021. The study was approved by the institutional ethical and research committee. A total of 288 subjects were included in the study comprising of equal number of Males and Females in the age range of 18-50 years. An informed and written consent was obtained by all the participating subjects.

A detailed ophthalmic examination was undertaken. Best corrected visual acuity was documented uniocularly under standard conditions by Snellen's chart. Those with refractive error in the range of ±5 diopters were included. Those with history of any ocular trauma or ocular surgery, any systemic disorders affecting corneal integrity, history of contact lens use, and IOP > 21 mm of Hg were excluded. Age and sex matched emmetropes visiting the outpatient services of department were included as controls. Both cases and controls were undertaken for measurement of CCT by ultrasonic pachymetry (Pachette 3 TM DGH 555, DGH Technology Inc, PA) under topical anesthesia. An average of 5 readings were taken and recorded in microns (µ). Quantitative data was recorded as mean±SD and analyzed using SPSS and paired-t test.

Results

A total of 187 eyes were taken as cases and 101 eyes as controls.

Among cases, 122 eyes were myopic (group-I) (mean CCT - 531.80±37.83µ) and 65 eyes were hypermetropic (Group-II) (mean CCT - 549.66±45.23µ). The mean CCT in controls was 547.68±30.98 µ. Details of CCT in cases and controls and the respective subgroups are given in [Table 1].

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Table 1: Shows mean CCT of cases and controls

Group	Subgroup	Number of patients	CCT (µ±S.D)
Cases	Myopic	122	531.80±37.83
Group1	1A- Myopic (<2D)	71	535.61±41.33
	1A- Myopic (<2D)	51	526.51±31.99
Group2	Hypermetropic	65	549.66±45.29
	2A- Hypermetropic (<2D	49	549.84±48.31
	2B- Hypermetropic (≥2D	16	549.13±35.53
Controls		101	547.68±30.98

The results shows that the central corneal thickness was decreased in the myopic eyes in comparison to the normal eyes which was statistically significantly (p=0.001). On further analysis in different subgroups, it was observed that the central corneal thickness decreases as the degree of myopia increases which was found to be statistically significant (p=0.001) as shown in [Table 2]. However in the hypermetropic group, no correlation was found between central corneal thickness and degree of hypermetropia.

Table 2: Comparison of groups and subgroups

Group	P-Value
Controls vs. Myopia	0.001
Controls vs. Hypermetropia	0.738
Myopia vs. Hypermetropia	0.005
Controls vs. Myopia < 2	0.030
Controls vs. Myopia ≥ 2	0.001
Low Myopia vs. High Myopia	0.192
Controls vs. Low Hypermetropia	0.742
Controls vs. High Hypermetropia	0.886
Low Hypermetropia vs. High Hypermetropia	0.957

Discussion

Various studies have been undertaken regarding correlation of central corneal thickness and refractive errors but results have been variable. Also demographic and ethnic variations do occur in different groups of population. The purpose of our study was thus to obtain a pilot morphological data of CCT in correlation to refractive error in our set of rural population.

We observed that in our study group, the central corneal thickness was significantly decreased (p=0.001) in the myopic eyes in comparison to the normal eyes. On further analysis in different subgroups, it was observed that the central corneal thickness significantly decreases as degree of myopia increases (p=0.001). However in the hypermetropic group, no correlation was found between central corneal thickness and degree of hypermetropia.

Our results are in agreement with various studies available in literature like Chang et al who in their study reported that the corneas were thinner in more myopic eyes in 216 young adults within an averaged refractive error of -4.17 diopters.[7] The mean corneal thickness was found to be 533 (SD 29)µm and corneas were thinner in more myopic eyes.

However, Beijing eye study, Cho and Lam, and Tong et al did not find any significant correlation between CCT and refraction in 4439 Chinese, 151 Hong Kong Chinese and 622 Singaporean school children respectively.[9-11] Cho and Lam found that central corneal thickness decreased with increasing age but not with corneal curvatures or refractive error. Also in the study by Chen et al. which included 500 Taiwanese Chinese patients, no correlation was found between CCT and refraction error.[12]

It has been seen that CCT has large spectrum of distribution which vary among populations of different ethnic background. Study by Fam et al reported a mean CCT of 535µm in Chinese adult population.[8] The average CCT in the study by Tahra et al was found to be 544µm (range 414- 659µm).[13]

Conflicting results have been found in the studies done to evaluate the correlation between degree of myopia and CCT. Some found no correlation between corneal thickness and refractive error while others reported the association of lower corneal thickness, steeper cornea, and myopia.[14,15]

Rufer et al found significant difference between young (591± 41µm) and old (600±39µ).[16] Since no such related studies have been done within our set of population therefore we tried to find the correlation between CCT and errors of refraction.

In our study, CCT in myopic eyes was significantly less in comparison to emmetropic eyes; while no correlation was found with the degree of hypemetropia. Also this less than normal value of CCT in myopic subjects is in accordance with the literature available.

Conclusion

Our study provides pilot data of CCT in different types of refractive errors which helps us in understanding the variation of CCT with refractive errors.

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