



Original Article

Comparison of Central and Peripheral Corneal Thickness in Different Degrees of Myopia

Authors

Maoz Khan¹Muhammad Suhail Sarwar²Saba Jahangir³

Correspondence Author:

Correspondence to:

Maoz KhanOptometry Intern, COAVS,
Lahore

Purpose: To find out the comparison and correlation of corneal thickness in different regions (central versus peripheral) in various grades of myopia (mild, moderate and severe), and to note any changes occurring in these regions and in these different grades.

Materials and Methods: This was a comparative cross sectional study. Retinoscope and pachymeter were used in the study to measure the corneal thickness and assess different grades of the refractive error. Data were gathered using self-designed Proforma after taking informed consent, Analysis was done using SPSS software to evaluate the comparison and correlation of corneal thickness in the central (CCT) vs peripheral regions (PCT). The study was conducted on 54 patients having myopia of different degree with age range of 13 to 50 years. Visual acuity of patient was taken by using log Mar Chart at 4m..

Results: This study includes a total of 54 patients (include both right and left eyes). Out of 54 Patients 51.85% (28) were male and 48.15% (26) were female. There was no significant difference found between corneal thickness in the central and peripheral regions in subjects having mild, moderate and severe grade of myopia ($p>0.05$). The mean value of CCT of both eyes is 535 ± 5 and PCT was 669 ± 38.50 , 660 ± 30.0 , 720 ± 40.92 , and 750 ± 46.92 for superior inferior nasal and temporal respectively.

Conclusion: This study concludes that the difference between corneal thickness in central and peripheral region was not significant. Similarly, Thickness is not affected by mild, moderate and severe myopic eyes to the extent that might need a change in treatment modalities..

Keywords: Axial length, Central corneal thickness, Diopter, Pachymetry, Peripheral corneal thickness, Spherical equivalent.



Introduction

Cornea is the sensitive non vascular outermost layer of eye. With transparency and its dome shaped surface cornea has different thickness at center (0.5-0.54 mm) and periphery (0.65-1 mm). Due to high refractive power of cornea (+43D) it plays an important role in focusing our vision.¹ Corneal thickness is a basic indicator of the condition of the cornea. Changing it may be indicative of various imbalances. Therefore, it is very important in clinical practice to achieve the value of most accurate corneal pachymetry per patient.² Corneal thickness done by pachymetry depends upon age of the person, contact lens usage, and/ or any pre-existing corneal disease.³

Accurate measurement of corneal thickness in the central part (CCT) is very important in the management of different conditions such as correct measurement of intraocular pressure for management of glaucoma, accurate determination of corneal edema as well as during refractive surgery.⁴ At the same time measurement of some peripheral areas of cornea is often needed during keratoconus management and follow up. Use of these measurements is also imperative in corneal procedures such as Radial keratotomies, corneal cross linkage surgery and intra-stromal ring placement.⁵ Normal, healthy cornea is about 0.56 mm thick in the central part upto 25 yrs of age. Thereafter it thickens to be about 0.57 mm at the age of 65 years. Hence accurate measurement of central cornea with respect to age has to be considered.⁶ This acquires more importance when we consider these parameters in the diagnosis of diseases like keratoconus, keratoglous or pellucid degeneration of cornea.⁷

Prevalence of myopia varies across the world. From 25% of population in the West, it may affect as much as 80% of the population in some parts of South east Asia.⁸ Myopia occurs if the axial length of the eyeball increases or if the corneal curvature becomes too steep. As a result, the light entering the eye do not focus on retina and image is formed in front of retina.¹ Refractive errors particularly myopia can have a deleterious effect on the personality, educational activities as well the social life of an individual. Consequently, it may also result in economic hardships pushing backward the standard of life of the sufferer.⁹ The prevalence of myopia varies from country to country. It can also vary with relation to age, ethnicity, gender, race, socioeconomic

status etc.¹⁰ In the National Survey for Blindness 2002-4 in Pakistan, proportion of myopia was found to be 36.5% among all refractive errors in individuals 30 years and above¹¹

Myopia on basis of degree is usually classified as "low to moderate" or "Simple myopia" (ranging from -0.5 to -6.0 diopters) and "high" or "pathological myopia" (more than -6.0 D).¹² Simple myopia is a most common type of refractive error, it's onset is usually between 5-10 years of age and gradually increases upto 20-25 years of age.¹ Individuals having axial length in excess of 26 mm are found to have high or pathological variant while those having axial length less than 26 mm are found to have simple or low myopia The patients with high myopia also have less retinal nerve fiber thickness compared with emmetropic eyes.¹³

In myopia, there is elongation in the eyeball resulting in stretching of all three layers of the eyeball.¹⁴ Therefore, people having higher myopia have steeper cornea, deep anterior chambers and increased corneal diameters (measured as white-to-white) in comparison with those having low myopia^{15,16} Most of the studies found in literature worldwide have sought to establish a relationship between Central corneal thickness and severity of myopia and hardly any study mentions the relationship of myopic severity with peripheral corneal thickness. Even the studies that attempted to determine relationship between CCT and myopia have yielded controversial results. A few studies showed that myopic eyes have increased corneal thickness while others had thin corneas. Still other studies showed no relationship between the two variables. These conflicting results have led to the need of newer studies in order to resolve the debate.

Methodology

Ethical clearance to conduct the study was obtained from College of Ophthalmology and Allied Sciences, King Edward Medical University Lahore. A comparative cross sectional study was performed. A structured Proforma and Informed consent was made to evaluate the comparison and correlation of central and peripheral corneal thickness with different degree of myopic patient. The study was conducted from a study population of patients visiting Mayo Hospital eye OPD for refraction a study sample 54 patients having myopia with range of 13 to 50 year of age. The study group was taken

without discrimination of gender and excluding those who were mentally retarded, who had other pathological disorders of the eye, uncooperative patients, those who were not giving their data. Visual acuity of patient was taken by using log Mar Chart. Refraction was done by both retinoscopic and subjective refraction. Corneal thickness was measured by pachymetry. Data was entered on the computer and analyzed using the SPSS 20.0 software. The results were analyzed and tabulated using the same software. ANOVA test was used to compare the central and peripheral corneal thickness.

Results

Table 1: Descriptive statistics and ANOVA test results.

Variables	Mean	SD	Min	Max	95% C.I	p-Value
RE CCT	538.33	30.05	418.00	595.00	530.12- 546.53	.623
RE PCT Sup	670.75	33.47	591.00	718.00	661.62- 679.89	.944
RE PCT Inf	662.75	31.44	599.00	735.00	654.17- 671.34	.003
RE PCT Nasal	716.74	46.92	601.00	870.00	703.93- 729.54	.074
RE PCT Temp	684.94	34.58	606.00	770.00	675.50- 694.38	.801
LE CCT	532.88	30.16	416.00	585.00	524.65- 541.12	.842
LE PCT Sup	669.12	43.15	600.00	818.00	657.35- 680.90	.584
LE PCT Inf	660.01	36.97	599.00	769.00	649.92- 670.11	.107
LE PCT Nasal	730.94	41.82	655.00	829.00	719.50- 742.38	.233
LE PCT Temp	804.72	875.65	612.00	7115.00	565.71- 1043.7	.529

Table 1 depicts the Mean thickness of central corneal, as well as the different peripheral (Superior, inferior, nasal and temporal) locations of all the 54 subjects, along with Minimum, maximum, standard deviation (SD) and 95% confidence Intervals. Analysis of Variances (ANOVA) was used as a test of significance. The analysis shows that the differences in central and peripheral corneal thicknesses were not statistically significant ($p > 0.05$). The mean value of CCT of both eyes is 535 ± 5 and PCT is 669 ± 38.50 , 660 ± 30.0 , 720 ± 40.92 , and 750 ± 46.92 for superior inferior nasal and temporal respectively.

Discussion

Cornea is the sensitive non vascular outermost layer of eye. With transparency and its dome shaped surface cornea has different thickness at central it is thinnest and thickest at peripheral. Due to high refractive power of cornea (+43D) it plays an important role in

focusing our vision. Corneal thickness done by pachymetry depends upon age of the person, contact lens usage, and/ or any co-existing corneal disease. The diagnosis of central corneal thickness is necessary for the planning of refractive surgery, diagnosis of glaucoma, and controlling of corneal edema. In addition, the mid-peripheral corneal thickness (MPCT) assessment is also necessary for diagnosis and follow-up of keratoconus and for corneal surgeries such as corneal cross-linking, radial keratotomy, and intrastromal ring placement.

Globally, myopia is the commonest refractive error with a prevalence ranging from approximately 25% in the West and going up to 80% in certain Far East Asian countries. An increase in axial length or corneal curvature results in myopia. As a result, the light entering the eye do not fall on retina and image formed in front of retina. Clinically, on basis of grade, myopia can be categorized in different groups; Mild myopia (upto -3.00D), Moderate myopia (from -3.0 to -6.0 D) and High myopia (> -6.00 D). Myopia is not just an ocular disease but it has an impact on personal life, social interaction, educational activities and even socioeconomic development of individuals.

This study was undertaken to find out the comparison and correlation of corneal thickness in different regions (central versus peripheral) in various grades of myopia (mild, moderate and high), and to note any changes occurring in these regions and in these different grades. It was carried out at Eye ward, Mayo Hospital Lahore. 54 patients were included in the study and their age was ranging from 13-50 years. Male were more prevalent (i.e. 51.85%) than females (i.e. 48.15%) in the study. There was no significant difference found between corneal thickness in the central and peripheral regions in subjects having mild, moderate and severe grade of myopia ($p > 0.05$). The mean value of CCT of both eyes is 535 ± 5 and PCT was 669 ± 38.50 , 660 ± 30.0 , 720 ± 40.92 , and 750 ± 46.92 for superior inferior nasal and temporal respectively.

The relationship between refractive error and the CCT has been previously reported in different studies. However, the results of these studies are debatable. Few found that subjects with myopia had thin corneas, whereas others found that myopic eyes have thick corneas, whereas others did not find any relationship between the CCT and the severity of

myopia.¹⁷ In our study it was found that there is no relationship between corneal thickness and the degree of myopia that might necessitate any change in strategy for managing and following up different corneal diseases and procedures such as refractive surgeries, corneal ectasia management and glaucoma management.

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Authors' Affiliation

¹Maoz Khan
Intern Optometry,
College of Ophthalmology & Allied Vision Sciences,
Lahore.

²Dr. Sohail Sarwar
Associate Professor,
Diagnostic Ophthalmology,
College of Ophthalmology & Allied Vision Sciences,
Lahore.

³Dr. Saba Jahangir, Medical Officer,
DHQ Bhimber, AJK.