



Original Article

RELATIONSHIP BETWEEN CENTRAL CORNEAL THICKNESS AND TIME DURATION OF GLAUCOMA.

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BACKGROUND: Determination of CCT in patients with glaucoma is very critical, as it has great impact on IOP values, which is very important parameter in diagnosis of glaucoma. The purpose of this study was to estimate mean central corneal thickness (CCT) of glaucomatous patients and to determine whether there is any relationship between CCT with time duration of glaucoma.

OBJECTIVE: Comparison between the changes in CCT (central corneal thickness) and the duration of glaucoma in glaucomatous patients visiting Mayo Hospital, Lahore.

MATERIALS AND METHODS: CCT values were measured in 298 eyes of 149 patients visiting in mayo hospital Lahore. The parameters compared were central corneal thickness and duration of glaucoma. CCT was done with ultrasonic pachymeter and duration of onset of glaucoma was asked from patients.

RESULTS: The mean central corneal thickness of patients having glaucoma from 1, 2,3,4,5,6,7,8,9 and 10 year is $535.16 \pm 42.81 \mu$ (Standard error, SEM=5.191), $542.81 \pm 38.50 \mu$ (SEM=5.068), $539.30 \pm 32.58 \mu$ (SEM=4.01), $535.04 \pm 46.46 \mu$ (SEM=9.11), $562 \pm 66.66 \mu$ (SEM=12.5), $545.04 \pm 42.92 \mu$ (SEM=8.42), $535.38 \pm 15.05 \mu$ (SEM=5.32), $554.20 \pm 24.34 \mu$ (SEM=7.60), $550.33 \pm 61.61 \mu$ (SEM=5.15) and $558.50 \pm 15.71 \mu$ (SEM=5.50) respectively. There is no statistical difference between CCT in different duration of glaucoma ($p=0.654$).

CONCLUSION: It is concluded that there is no correlation between CCT and duration of glaucoma ($p>0.05$).



INTRODUCTION:

Glaucoma is a leading cause of visual loss in the world which is increasing day by day. The main reason of its severity is that it is not diagnosed on time due to unawareness of people. There is need to aware people about it and its complications so that it can be diagnosed in time to achieve a reduction in prevalence of low vision and blindness.¹

Cornea is a part of optical system of eye and its condition is directly related to eyesight. Careful measurements should be done to evaluate corneal thickness and other parameters. It is measured with different instruments including ultrasonic pachymeter, Orbscan, optical coherence tomography etc. But ultrasonic Pachymetry is gold standard and most common. Central corneal thickness in patients of glaucoma is independent of gender and laterality but it become thin with age. A thin cornea is risk factor for visual loss and optic disc enlargement thus the systemic evaluation of Central corneal thickness are very important to assess the progression of glaucoma.^{2,3} So this study includes analysis of changes in Central corneal thickness with increasing duration of glaucoma in patients of glaucoma having glaucoma from 1 year, 2 years, and 3 years and so on. Central corneal has significant impact of age it seems that there is a decrease in Central corneal thickness values with age in emmetropic subjects.⁴ Central corneal thickness has great association with age and Intraocular pressure as it may over or underestimate its values while doing applanation tonometry but it is independent of laterality and gender. Central corneal thickness has great association with glaucoma diagnosis. Significant association of age and Intra ocular pressure was found with Central corneal thickness and in future CCT will be consider as an independent risk factor in diagnosis and management of glaucoma.⁵

MATERIALS AND METHODS:

We conducted this study at College of Ophthalmology and Allied Vision Sciences and mayo hospital eye ward, Lahore, Pakistan. It was a cross-sectional study with purposive sampling technique. Central Corneal Thickness (CCT) values of 298 eyes of 149 patients visiting in mayo hospital Lahore were measured. The parameters compared were Central corneal thickness and duration of glaucoma. Confidence interval of 0.95 with α of 0.05 was taken. As this was a descriptive study, therefore, no sampling calculation was made for it. The inclusion criterion was patients of glaucoma regardless of gender in our study. We excluded patients with preexisting ocular pathologies, history of contact lens wear, history of intraocular surgery, psychologically retarded patient and uncooperative patient. After informed consent, all patients underwent a comprehensive ophthalmic assessment which consisted of history regarding refractive errors, glaucoma, use of topical steroids, use of contact lenses,

history of refractive surgery or laser. After anesthetizing the eye with topical proparacaine 0.5% and using the fluorescein strips 2%, we measured IOP in both eyes using Goldmann applanation tonometer. We took three consecutive readings and the mean was noted. CCT was measured with ultrasonic pachymeter (Pac Scan 300p digital biometric ruler). The ultrasound pachymeter was calibrated at the beginning of each day according to the manufacturer's instructions. After anesthetizing the cornea with topical proparacaine 0.5% and the patient looking in primary position of gaze, the pachymeter probe was placed on the center of the cornea. Five measurements were taken from each eye and the average was used for analysis. The data was entered in MS Excel and was cleaned and analyzed using SPSS. Mean \pm SD was calculated for all quantitative variables. Frequencies and percentage was computed for qualitative variables such as gender. Pearson correlation test was applied to find the relationship between corneal thickness and intraocular pressure at p less than or equal to 0.05 level of significance.

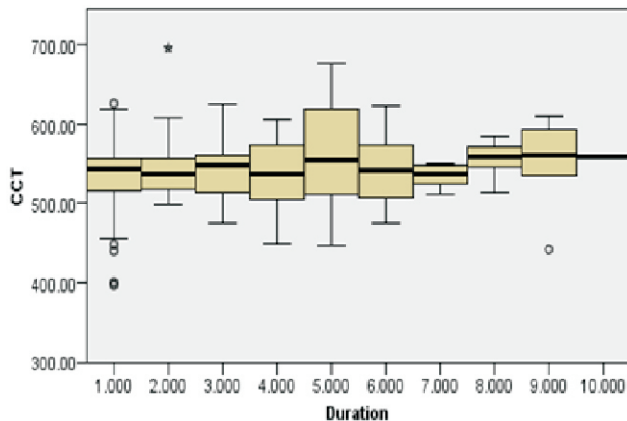
RESULTS:

The CCT (central corneal thickness) value is compared between the duration of glaucoma in 149 patients of glaucoma including male and females. The table shows mean CCT of patients as well as standard deviations and mean error with time duration.

Durati on of	Mean CCT	Std. Error of Mean	Std. Deviation	Variance	Minimu m	Maxim um
Glau coma (years)	(microns)				(microns)	(microns)
1	535.16	5.191	42.805	1832.257	397	626
2	543.51	5.387	40.671	1654.112	499	720
3	539.3	4.01	32.578	1061.322	476	625
4	535.04	9.112	46.464	2158.918	449	606
5	562	12.598	66.661	4443.63	448	677
6	545.04	8.416	42.915	1841.718	474	622
7	535.38	5.322	15.052	226.554	512	551
8	554.2	7.698	24.344	592.622	513	585
9	550.33	25.154	61.614	796.267	442	611
10	558.5	5.5	15.707	672.5	558	559

The mean CCT of glaucomatous patients suffering from 1,2,3,4,5,6,7,8,9 and 10 year is $535.16 \pm 42.81 \mu$ (mean error, ME=5.191), $542.81 \pm 38.50 \mu$ (ME=5.068), $539.30 \pm 32.58 \mu$ (ME=4.01), $535.04 \pm 46.46 \mu$ (ME=9.11), $562 \pm 66.66 \mu$ (ME=12.5), $545.04 \pm 42.92 \mu$ (ME=8.42), $535.38 \pm 15.05 \mu$ (ME=5.32), $554.20 \pm 24.34 \mu$ (ME=7.60), $550.33 \pm 61.61 \mu$ (ME=25.15) and $558.50 \pm 15.71 \mu$ (ME=5.50) respectively. There is no statistical difference between central corneal thickness and duration of glaucoma (p -value > 0.05).

The boxplot given below shows mean CCT of patients among different groups.



DISCUSSION:

From the statistics it is proved that there was no significant relation between CCT and duration of glaucoma as p-value was greater than 0.05 however, CCT is slightly increased with the increase in duration of glaucoma.

However, in previous studies, it decreases with the increase in glaucoma.⁶ Herndon LW et al. described that central corneal thickness was lower in advanced cases of glaucoma so it was thought as an important risk factor. As the glaucoma progresses the values of central corneal thickness becomes lower in that patients.⁷ Determination of CCT in patients with glaucoma is very critical, as it has great impact on Intra ocular pressure values, which is very important parameter in diagnosis of glaucoma, also for the monitoring of further progress of ocular hypertension and patients of glaucoma which are already diagnosed.⁸

The CCT values are compared between the glaucomatous patients taking anti-glaucomatous drugs and those who are not taking anti-glaucomatous drugs. The mean CCT is $543 \pm 35.091 \mu$ and $541 \pm 2.894 \mu$ of patients taking anti glaucoma drugs and those who don't taking respectively. So those who were taking anti-glaucoma medicines have less CCT value as compared to those who were not taking.

From family history of patients it was noted that the number of patients decreases with increasing duration of glaucoma. There were more chances of glaucoma in those who have previous family glaucoma history.

Those patients who had family History were taking anti glaucoma drugs properly while those patients in which family history were absent are not so much concerned about their treatment. Family ocular history is an important factor among patients of glaucoma.

CCT values were compared between different age groups. The results showed that there was no significant difference between them. A previous study also supported our result that there was no effect of central corneal thickness with age.⁹

There was no positive or negative correlation in central corneal thickness, duration and age. In a previous study, a negative association with age and positive association with

IOP were seen.¹⁰ There are many factors which caused variation among my study and different other studies. It might be due to sample size, study design, race ethnicity etc. it is may be due to the fact that my sample size was not large enough to represent our whole population.

CONCLUSION:

As per our observation it is concluded that there is no statistical difference between central corneal thickness and duration of glaucoma (p-value >0.05). However, the CCT values slightly increases with duration of glaucoma.

REFERENCES:

1. Baskaran M, Foo RC, Cheng CY, Narayanaswamy AK, Zheng YF, Wu R, et al. The Prevalence and Types of Glaucoma in an Urban Chinese Population: The Singapore Chinese Eye Study. *JAMA Ophthalmol.* 2015.
2. Wang SY, Melles R, Lin SC. The impact of central corneal thickness on the risk for glaucoma in a large multiethnic population. *J Glaucoma.* 2014;23(9):606-12.
3. Ndiaye-Sow MN, Dieng M, Seck SM, Agboton GA, Diakhate-Diouf M, Gueye NN, et al. [Central corneal thickness in Senegalese melanoderms with primary open angle glaucoma]. *J Fr Ophtalmol.* 2014;37(7):535-9.
4. Sanchis-Gimeno JA, Lleo-Perez A, Alonso L, Rahhal MS. Caucasian emmetropic aged subjects have reduced corneal thickness values: emmetropia, CCT and age. *Int Ophthalmol.* 2004;25(4):243-6.
5. Day AC, Machin D, Aung T, Gazzard G, Husain R, Chew PT, et al. Central corneal thickness and glaucoma in East Asian people. *Invest Ophthalmol Vis Sci.* 2011;52(11):8407-12.
6. Natarajan M, Das K, Jeganathan J. Comparison of central corneal thickness of primary open angle glaucoma patients with normal controls in South India. *Oman J Ophthalmol.* 2013;6(1):33-6.
7. Herndon LW, Weizer JS, Stinnett SS. Central corneal thickness as a risk factor for advanced glaucoma damage. *Arch Ophthalmol.* 2004;122(1):17-21.
8. Janicijevic-Petrovic MA, Sarenac-Vulovic TS, Janicijevic KM, Vulovic DA, Andrijana PB, Vujic DI. Evaluation of central corneal thickness in patients with ocular hypertension and primary open-angle glaucoma. *Med Glas.* 2014;11(1):115-9.
9. Prasad A, Fry K, Hersh PS. Relationship of age and refraction to central corneal thickness. *Cornea.* 2011;30(5):553-5.
10. Vijaya L, George R, Arvind H, Ve Ramesh S, Baskaran M, Raju P, et al. Central corneal thickness in adult South Indians: the Chennai Glaucoma Study. *Ophthalmology.* 2010;117(4):700-4.