



IMPACT OF AGE ON CENTRAL CORNEAL THICKNESS IN NORMAL POPULATION AND GLAUCOMA PATIENTS

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ABSTRACT

Introduction: Cornea plays major role in vision as it is an integral part of the ocular media. Measurement of corneal thickness has emerged to have higher prognostic value for diagnosis and management of glaucoma, determination of the success of refractive surgeries, anticipation of post-surgical complications. CCT is known to be affected by several factors such as age, gender, ethnicity and time of day. **Purpose:** The study aimed at determining mean central corneal thickness (CCT) and evaluating any correlations between CCT and age in normal adults and glaucoma patients. **Method:** This study included 381 eyes (169 glaucoma and 212 normal adults) of participants examined in a glaucoma clinic and eye OPD in S.S. Medical College, Rewa (M.P.) during the period January 2019 to September, 2020. CCT was measured by ultrasonic pachymetry. Stratification of subjects was done into four groups by age. Correlations between CCT, age and gender were evaluated. **Results:** Mean CCT in subjects aged 41-50 years was $525.78 \pm 10.85 \mu\text{m}$, $526.2 \pm 11.95 \mu\text{m}$ in 51-60 years, $525.75 \pm 11.48 \mu\text{m}$ and $525.28 \pm 10.37 \mu\text{m}$ in 61-70 years and 71-81 years, respectively. No statistically significant difference in CCT was found between males and females. A statistically significant negative correlation was found between CCT and gender ($r = -0.2$, $p = 0.04$) that was stronger in men ($r = -0.42$, $p = 0.02$) than in women ($r = -0.31$, $p = 0.03$) in normal population. CCT showed strong negative correlation with age in normal individuals ($r = -0.42$, $p = 0.002$). Age and CCT could not be correlated in glaucoma patients. **Conclusion:** The mean CCT in normal adults was $537.3 \pm 13.3 \mu\text{m}$ whereas in glaucoma patients was $515.28 \pm \mu\text{m}$. The mean CCT values in males were $537.4 \pm 10.8 \mu\text{m}$ and $515.3 \pm 12.6 \mu\text{m}$ in normal population and in glaucoma patients respectively. Females had mean CCT values of $537.3 \pm 10.9 \mu\text{m}$ in normal population and $515.25 \pm 12.8 \mu\text{m}$ among glaucoma patients. CCT showed a decreasing trend over the lifetime. CCT did not differ significantly among the study groups.

KEYWORDS : central corneal thickness, age, gender

INTRODUCTION:

Significance of central corneal thickness (CCT) has been emphasized in many ocular and systemic conditions. Among ocular diseases, central corneal thickness (CCT) has been implicated to affect glaucoma predisposition since long. Notably, thinner CCT has been found to be a risk factor for open-angle glaucoma in several reports.^(1,2) CCT varies between different ethnic groups as shown in different studies comparing the CCT values in normal and glaucomatous eyes between Asians, Caucasians, Hispanics and African Americans.^(3,4,5) Cornea seems to undergo age-related anatomic changes as it is significantly thicker in the age group of 40-80 years than in individuals below 40 years of age. Also, CCT measurements reflect structural composition and metabolic status of cornea and hence, is thought to affect corneal rigidity and measurement of intraocular pressure. Several studies have shown that CCT varies among individuals with different types of glaucoma (POAG, OHT, NTG).^(6,7) Normal value of mean CCT varies between 520- 540 microns. Knowledge of these ethnicity-related and age-related physiologic changes allows assessment of disease influence and surgical procedures more accurately.

METHODS:

The following is a cross-sectional observational study to evaluate central corneal thickness (CCT) normal adults and in different types of glaucoma. A total of 169 eyes of patients diagnosed with different types of glaucoma and 212 eyes of 106 controls attending the Glaucoma Clinic of Ophthalmology Department of S.S. Medical College, Rewa (M.P.) during the period January 2019 to September, 2020 were enrolled in the study. Subjects older than 18 years and diagnosed with POAG or NTG were included while those with secondary glaucomas, diabetes mellitus, current conjunctivitis, or wearing of contact lenses, corneal pathology or those who underwent any ocular surgery that might affect pachymetry were excluded from the study.

The subjects were categorized into four groups on the basis of age as: 41-50 years, 51-60 years, 61-70 years and 71-80 years. The gender distribution of the participants was done similarly as the age ranges. Mean CCT was calculated and the results were compared between the groups. Correlations between CCT, age, and gender were found. Corneal thickness measurement was recorded during the daytime

(between 9 a.m. and 12 noon). After anesthetizing cornea using topical 2% lignocaine, the probe of the ultrasound pachymeter was touched perpendicularly to the center of the cornea with an undilated pupil. Five measurements were recorded for all subjects and mean was calculated for analysis. The same pachymeter Appascan- MAX P (IAPB)-20 MHz ophthalmic ultrasound pachymeter was used for all measurements.

Statistical Analysis Plan:

Sample population was described and eyes were included via descriptive statistics including numbers (percentages) and mean (\pm standard deviation SD). Independent sample t-test was used to study differences in general parameters. Spearman's test, after controlling for gender, was performed to confirm association results. Pearson correlation coefficient was used to study association between central corneal thickness, age and gender. Threshold of 0.05 was considered for p value to indicate statistical significance.

Result And Discussion :

A total of 169 eyes of 85 patients diagnosed with different types of glaucoma and 212 eyes of 106 controls attending the ophthalmology clinic were examined.

Table 1: Distribution Of Subjects According To Age

AGE GROUP (in years)	TEST SUBJECTS		CONTROLS	
	NUMBER	%	NUMBER	%
41-50	16	18.8	14	13.2
51-60	24	28.2	34	32.1
61-70	28	32.9	36	33.96
71-80	17	20.1	22	20.74
TOTAL	85	100	106	100

Table 1 depicts that the study subjects were categorized into four groups according to age. Maximum number of subjects lied in the age range 61-70 years in both glaucoma and control groups while least number of subjects fell in the age range 41-50 years showing that the study groups were age matched.

Table 2: Distribution of subjects according to gender

GENDER	TEST SUBJECTS		CONTROLS	
	NUMBER	%	NUMBER	%
MALE	40	47.1	52	49.1
FEMALE	45	52.9	54	50.9
TOTAL	85	100	106	100

Table 2 depicts that the study subjects were matched for gender with almost similar number of males and females in the test subjects as well as the controls. Slight female predominance was observed among glaucoma patients.

Table 3: Distribution of mean CCT according to age and gender

Age (years)	Mean CCT (μm)			
	Male		Female	
Age groups	Normal adults	Glaucoma	Normal adults	Glaucoma
41-50	539.4 \pm 8.5	514.7 \pm 11.9	537.2 \pm 10.9	510.8 \pm 12.1
51-60	536.7 \pm 11.3	515.2 \pm 13.1	537.1 \pm 10.7	515.8 \pm 12.7
61-70	534.3 \pm 10.7	516.9 \pm 11.9	536.7 \pm 10.3	515.1 \pm 13.0
71-80	533.1 \pm 9.1	519.1 \pm 11.5	534.6 \pm 10.5	514.3 \pm 10.4
TOTAL	537.4 \pm 10.8	515.3 \pm 12.6	537.3 \pm 10.9	515.25 \pm 12.8

Table 3 depicts mean central corneal thickness in all four age groups among glaucoma patients and normal individuals. Mean CCT values in normal adults showed consistent decrease with increasing age among all age groups whereas no such trend was observed among glaucoma patients in both males as well as females. Significantly lower mean CCT values were found in glaucoma patients as compared to controls in both males and females ($p < 0.05$).

CONCLUSION:

Thinning of the cornea at a rate of 3–7 μm per decade has been observed in older age in some ethnic groups. A study in 1998 with 1,242 participants aged 10–87 years showed decrease in CCT by 5–6 μm for each decade of life. The impact of age on corneal thickness can be explained in a number of different ways. According to theory suggested by histological studies, older people have thinner corneas which can possibly be explained by the fact that there is reduction in keratocyte density and degeneration of collagen fibres.^[1] Also, exposure to environmental factors for a longer period of time might influence corneal structure in older individuals.

List of Abbreviations:

1. CCT - central corneal thickness
2. μm - micrometer
3. NTG - normal tension glaucoma
4. OHT - ocular hypertension
5. POAG - primary open angle glaucoma

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Competing interests: None

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