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Original Research Paper

Ophthalmology

A COMPARATIVE STUDY OF CENTRAL CORNEAL THICKNESS (CCT) BETWEEN DIABETIC AND NON- DIABETIC PATIENTS

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ABSTRACT

Introduction- The central corneal thickness is a sensitive indicator of health of cornea and may influence outcome in cataract, refractory surgeries and also affect the intraocular pressure measurement. So it is important to see effect of diabetes on CCT.

Material and methods- A cross- sectional study was conducted on 160 patients in department of ophthalmology, Govt. medical college, pali. Subjects were divided into 2 group- diabetics and non- diabetics. An ultrasound pachymeter was used to measure CCT.

Results- The statistically significant ($p<0.001$) increase in CCT was found in diabetic patients compared to non- diabetic patients.

KEYWORDS : Central corneal thickness, Diabetes

INTRODUCTION:-

Although diabetic retinopathy is major concern and may lead to severe vision loss, keratopathy should also be kept in the mind in diabetics as diabetic cornea has higher potential to decompensate following stress. The central corneal thickness is a sensitive indicator of health of cornea and serves as an index for corneal hydration and metabolism. Diabetes mellitus has detrimental effects on physiology, morphology and clinical appearances of human cornea. Diabetic changes may manifest in the corneal epithelium, basement membrane, stroma and endothelium.[1,2,3] There are functional changes in diabetic cornea as a result of increased central corneal thickness. There are two theories behind increased central corneal thickness, firstly in diabetics, sorbitol accumulation within corneal endothelial cells[4] and a decrease in Na+/K+ ATPase activity[5] induce dysfunction of the corneal endothelium cell layer leading to corneal hydration which translates to increased CCT measurements. Thus, corneal thickness indirectly indicates the functioning of the endothelial layer. Secondly, changes occur in corneal stroma in diabetics, which include structural alterations produced by collagen cross linking. Advanced glycation products accumulate in collagen proteins, resulting in the formation of covalent cross-linking bonds, and may lead to increased corneal thickening and biomechanical changes.[6,7] Ultrasound pachymetry is the current standard for corneal thickness measurement. [8]The measurement of central corneal thickness (CCT) has become a very crucial ocular parameter due to its importance as an indicator of corneal health status, and decisions involving refractive surgeries are some time dependent on CCT. Also in glaucoma patients central corneal thickness measurement is important to determine the true intra ocular pressure which may be overestimated in diabetic patients with glaucoma due to increased CCT.[9,10]

MATERIAL AND METHODS:-

A cross sectional study was conducted on 160 subjects (83 diabetics and 77 non diabetics) attending outpatient department of Govt. Medical college, Pali from August, 2019 to August,2020. Central corneal thickness was measured using ultrasonic pachymetry in all subjects and evaluation was done for statistical significance.

INCLUSION CRITERIA- 83 diabetic patients (previously diagnosed by medical practitioner) who gave consent were enrolled irrespective of level of blood sugar. 77 age matched controls (non-diabetics by history and blood sugar level) were also enrolled. Diabetic patients were further subdivided into 3 subgroups-

Subgroup 1- having no diabetic retinopathy
Subgroup 2- having non- proliferative retinopathy
Subgroup 3- having proliferative diabetic retinopathy

EXCLUSION CRITERIA-

Eyes with corneal pathologies like pterygium, corneal dystrophies etc., history of ocular surgery or trauma, contact lens users, any active or previous ocular inflammation.

Informed consent was taken from all the participants in the study. After taking detailed history, complete routine anterior and posterior segment evaluation was done. The corneal thickness measurement was done for 320 eyes of 83 diabetics and 77 non- diabetic patients with the help of ultrasound pachymeter. All readings were taken by single examiner and analysis was done.

RESULTS AND DISCUSSION:-

Table -1 Age Distribution Of The Patients

AGE GROUP (YEARS)	DIABETICS (n=83)	NON DIABETICCONTROLS (n=77)
30-40	06(7.23%)	10 (12.98%)
41-50	15(18.07%)	20 (25.97%)
51-60	33 (39.75%)	27 (35.06%)
61-70	22 (26.50%)	15 (19.48%))
71-80	07 (8.43%)	05 (6.49%)

Table -2 Gender Distribution Of The Patients

GENDER	DIABETICS (n=83)	NON DIABETIC CONTROLS (n=77)	TOTAL
MALE	42 (50.60%)	45(58.44%)	87
FEMALE	41(49.39%)	32(41.55%)	73
TOTAL	83	77	160

Table 3-mean Central Corneal Thickness (μm) In Diabetics And Non Diabetics

GROUP	NO. OF CASES	MEAN CCT(μm)	STD.DEVIATION	P VALUE
DIABETICS	83	562.87	±10.98	P<0.0001

NON DIABETICS	77	530.02	±18.04	

Table 4-:mean Central Corneal Thickness(μm) Amongst Sub Group Of Diabetic Patients

GROUP	NO. OF CASES	MEAN CCT(μm)	STANDARD DEVIATIO
NO DIABETIC RETINOPATHY	32	559.02	8.07
NON PROLIFEIRATIVE DIABETIC RETINOPATHY	40	564.01	11.97
PROLIFERATIVE DIABETIC RETINOPATHY	11	562.98	10.05

Table 5-:clinical Data On Study Population

	CONTROL	NO DIABETIC RETINOPATHY	NON PROLIFEIRATIVE DIABETIC RETINOPATHY	PROLIFERATIVE DIABETIC RETINOPATHY
SUBJECTS (n)	77	32	40	11
MEAN AGE (YEARS)	53.78 ±11.05	55.62 ±11.0	55.63 ±10.79	57.08 ±10.93
MEAN CCT(μm)	530.03 ±18.01	558.81 ±7.67	563.81 ±12.32	563.43 ±9.70
SEX (MALE/ FEMALE)	45/32	17/15	20/20	5/6

Central corneal thickness has become an important indicator of corneal health status and decisions involving refractive surgery and estimation of intraocular pressure. In our study, 83 patients were diabetic, out of which 32 had no diabetic retinopathy, 40 had non- proliferative retinopathy and 11 had proliferative diabetic retinopathy. 77 subjects were non-diabetic controls.

Table 1 shows age distribution of study subjects which included patients between 30-80 years. Maximum no. of patients in both diabetic and non-diabetic group were in 51-60 year age group (39.75% & 35.06% respectively) whereas least common age group was 71-80 years (8.43% &6.49% in diabetic and non-diabetic group respectively).

In our study, M:F ratio is 1.19:1 (Table 2). In non- diabetic group, 45 males and 32 females were there with M:F ratio 1.4:1 while in diabetic group, 42 males and 41 females were there with M:F ratio 1.02.

Mean CCT was significantly more ($p<0.0001$) in diabetics as compared to non-diabetics. In present study, CCT was 562.87±10.98 microns in diabetic patients and 530.02±18.04 microns in non-diabetic patients (Table3).

Mean CCT was increased more in diabetic patients with non-proliferative diabetic retinopathy in comparison to diabetics with no diabetic retinopathy & diabetics with proliferative retinopathy (Table 4). Avg. CCT was 564.01±11.97 microns in diabetic patients with non-proliferative retinopathy. But the difference of CCT among these subgroups was not statistically significant ($p>0.05$).

Table 5 shows clinical data of the study population which shows mean age and mean CCT in control group and different diabetic subgroups. In present study, mean age of diabetics (55.75±11.01 years)and non-diabetic controls (53.78±11.05 years) was comparable and no statistical difference was found between them .This shows CCT was maximum in diabetic patients with non-proliferative retinopathy among all groups.

Rashmi Kumari et al[11] conducted case control study in Max Eye Hospital, Patna (may 2015 to april 2016) measured CCT in 100 patients out of which 50 were diabetic and 50 were non-diabetic and concluded that diabetic patients had thicker cornea as compared to non-diabetics. With regard to the mean age of our diabetic patients (55.75±11.01 years), this was similar **to Lee et al**[12](57.5±8.5years) and **Ozdamar et al**[13](57.3±4.7 years), and contrast to **Busted et al**[14](34 years). Most studies like present cross sectional study shows that the diabetic eye had increase in CCT (563.11±11.40μm) as compared to non diabeticcontrols.[12,13,14,15,16] (529.53±17.91μm). This difference was statistically significant (**p<0.0001**).**Busted et al**[14] (1981)and **Lee et al**[12] reported that the mean CCT of diabetic patients was significantly ($p<0.005$)thicker than non diabetic controls in a sample size of 81 insulin-dependent juvenile onset diabetics and concluded that increased CCT could be due to increased hydration of cornea and endothelial dysfunction. **Lee et al**[12]**(2006)** also drawn similar observation and concluded that corneal morphological abnormalities was more in diabetic patients. **YaseminOzdamar et al**[13] (2010) also conducted clinical study on 245 eyes and observed that mean CCT was significantly thicker in diabetic patients compared to non diabetic controls (**p=0.001**). **Toygaro O & B etal**[17] (2015) compared CCT between three subgroup of diabetic retinopathy and found mean CCT in subgroup 2 i.e. Non proliferative DR (560±38.3μm) was thicker than subgroup 1 i.e. No DR (552.5±38 μm) and subgroup 3 i.e. proliferative DR (550.1±38.3 μm), but the difference between them was not statistically significant (p=0.47). **Solani D et al**[18] (2015). They studied 65 diabetic patients and 50 non diabetic controls. The mean CCT was found to be comparable in threesub groups of diabetic retinopathy and the difference between them was not statistically significant (**p>0.05**).

CONCLUSION:- from our study, we cocluded that-

1. The mean central corneal thickness in diabetic group (562.87μm ±10.98μm) was found to be thicker than non diabetic controls(530.02±18.04μm) and the difference was statistically significant ($p<0.0001$) using unpaired- t test.
2. mean CCT amongst diabetic sub group was comparable having mean CCT in sub group 1, 2 and 3 were 559.02±8.07μm, 564.01±11.97μm, and 562.98±10.05μm respectively and the difference was not statistically significant ($p>0.05$) using one way ANOVA.

Retinopathy is one of major microvascular complication in long standing diabetes, but diabetic keratopathy has potential to decompensate following stress. The central corneal thickness is a sensitive indicator of health of cornea and may influence outcome in cataract, refractory surgeries and may lead to fallacy in Intraocular pressure measurement.

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