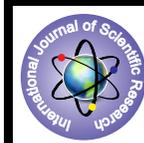


Correlation Between Central Corneal Thickness In Diabetics And Non Diabetics When Measured With Spectral Domain Optical Coherence Tomography



Medical Science

KEYWORDS : CCT, Diabetics, HbA1c

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ABSTRACT

Purpose: To compare the central corneal thickness(CCT) of diabetics with age and sex matched non-diabetic controls using SD-OCT and to study the correlation of CCT with HbA1c, duration of disease. Methods: Crosssectional observational study conducted on 50 diabetics and 50 nondiabetics age and sex matched. Results:CCT values of diabetics and non diabetics were noted to be different, statistically different(p value<.001) and CCT was found to be correlated with poor glycaemic control and duration of disease.Conclusion:CCT of diabetic patients is thicker , suggests endothelial dysfunction. Increase in CCT is considered to be one of the earliest clinically detectable changes of the diabetic eye. Diabetics with HbA1c >7% had thicker corneas than patients with < 7%. CCT was found to be thicker in diabetics >10 years duration.

INTRODUCTION

Diabetes mellitus is a worldwide disease, impacting society considerably, due to associated chronic complications and high prevalence rate^(10,11,12). Prevalence of diabetes worldwide was estimated to be 4.0% in 1995 and to rise to 5.4% by the year 2025. Presently it is higher in developed countries but by the year 2025 >75 % of people with diabetes are estimated to be residing in developing countries, as compared with 62% in 1995⁽¹³⁾. Symptoms may not appear initially, and disease may go unnoticed^(15,16). Therefore it is essential to consider statistics for the existence of undiagnosed diabetics. Early diagnosis is must as it helps to avoid complications , treatment being started at an earlier stage^(14,16,17). Diabetic eye disease is an end organ response to the effects of the condition on the human system. Diabetic retinopathy is most frequent cause of blindness for working age individuals^(18,19). Patients with diabetes not only develops diabetic retinopathy but also corneal endothelial damage and keratoepitheliopathy such as superficial punctate keratitis, recurrent corneal erosion, and persistent epithelial defects^(14,15). Diabetic keratopathy entails several changes seen in the epithelium and especially endothelium, resulting in a deficient pumping function, as well as cell alterations⁽²⁰⁾. Diabetic patients are more predisposed to persistent stromal edema after pars plana vitrectomy or other intraocular surgical procedures, suggesting that endothelial cells may have functional and morphological abnormalities⁽¹⁷⁾, such as decreased corneal sensitivity, increased corneal thickness, less endothelial cell density⁽⁴⁾. Visible lesions in eye take years to develop while functional abnormalities may be detected long before anatomical changes are evident. Vascular and corneal endothelium act as a cellular barrier. If endothelial function is compromised, corneal hydration will increase, reflected as increase in corneal thickness . Increased corneal thickness is considered to be one of the earliest clinically detectable changes of the diabetic eye.⁽¹⁾ Corneal thickness is normally 0.52 mm at the centre and 0.65mm at the periphery. There are many ways of measuring central corneal thickness- optical pachymeter, ultrasound pachymeter, Scheimpflug imaging, anterior segment OCT. Results show that the OCT is an accurate, noninvasive, and reproducible technique for evaluation of central corneal thickness⁽⁶⁾. The purpose of the present study is to determine and compare the differences in the central corneal thickness of diabetic and non-diabetic patients.

Materials and Methods

This was a cross sectional observational study conducted on 50 diabetics and 50 non diabetics age and sex matched with study period of 2 years, conducted at Kasturba Medical College Hospital, Attavar and Government Wenlock Hospital, Mangalore. Study had clearance from institutional ethics committee and

written informed consent was obtained. Inclusion criteria for cases were all diabetic individuals above 18 years of age and for controls non diabetic individuals with healthy corneas above 18 years of age. Exclusion criteria were corneal pathologies, previous ophthalmic intervention, laser treatment less than 2 weeks, ocular hypertension and glaucoma , recent contact lens wear, injury to eye. Patients diagnosed of diabetes mellitus were taken as cases and classified further as patients without diabetic retinopathy ,with non-proliferative diabetic retinopathy and with proliferative retinopathy. An ophthalmic evaluation including best corrected visual acuity and slit lamp examination was done. All patients above the age of 18 years after excluding the above mentioned exclusion criteria were taken as normal eyes. Central corneal thickness was measured using anterior segment OCT. Mean CCT were compared . HbA1c values of diabetics were noted and diabetics were grouped into those with poor glycaemic control (>7 %) and with good control (<7%) .Students unpaired t test, Fisher test were used to analyse the variables which predicted CCT . Sampling was done by nonrandom convenient sampling.

RESULTS

The mean central corneal thickness in diabetic patients was 541.02 ; 541.76 (Rt , Lt eyes), microns, respectively. The average central corneal thickness found in non-diabetic patients was 506.46; 506.90(Rt,Lt eyes)microns respectively(see table 1). Central corneal thickness in diabetics was found to be statistically significant as compared to nondiabetic patients .

Table 1:

PARAMETER	CASES	CONTROLS	P VALUE
Age	52.34 ± 8.75	51.56 ± 6.44	0.613
CCT Rt EYE	541.02 ± 20.18	506.46 ± 19.14	<0.001
CCT Lt EYE	541.76 ± 20.06	506.90± 17.28	<0.001

The mean central corneal thickness of diabetic patients for less than 10 years duration was 530.42; 531.58(Rt ,Lt eyes)microns, respectively, 558.32; 558.37(Rt , Lt eyes) microns, respectively for patients with duration more than 10 years, (see table 2). Increase in central corneal thickness with increase duration of diabetics, was found to be statistically significant

Table 2 :

CCT	DURATION		P value
	<10 YRS	>10 YRS	
Rt eye	530.42 ± 12.60	558.32 ± 18.28	<0.001
Lt eye	531.58 ± 12.50	558.37 ± 19.13	<0.001

Among diabetics , HbA1c values were divided into <7 and > 7 % . Central corneal thickness was found to be thicker in those who had a poor diabetic control (>7 %) in comparison to diabetics with good diabetic control (< 7%) . (see table 3,4)

Table 3 :

HbA1c	Frequency	Percentage
<7	23	46.0
>7	27	54.0
Total	50	100.0

Table 4 :

CCT	HbA1c		P value
	<7	>7	
Rt eye	528.52 ± 13.97	551.67 ± 18.60	<0.001
Lt eye	529.65 ± 13.77	552.07 ± 18.92	<0.001

DISCUSSION

Diabetic patient’s central corneal thickness is thicker as compared to non diabetics ,reason being physiological and morphological changes in diabetic cornea especially at the endothelium. (7,12) Various experimental studies have reported a decrease in the corneal endothelium density, a decrease in hexagonality, and increase in the coefficient of variation for cell size in the case of diabetes (22) .

McNamara et al (23) stated that corneal hydration is affected due to hyperglycemia thus increased corneal thickness in diabetics. Sonmez et al (24) suggested refractive changes seen in diabetic patients was due to hyperglycemia.Weston et al (19) report a decreased endothelial permeability in diabetic corneas during the different stages of hypoxia.

Busted et al (1) suggested the fact that increased corneal thickness is one of the most noticeable and earliest clinical changes of the diabetic eye(1). Diabetic subjects have thicker corneas and it is higher for diabetes over 10 years duration as compared to under 10 years duration.(4) It is noticed to change significantly as retinopathy progresses to more proliferative stages,thus indicating for regular follow up examinations which may herald the onset of proliferative retinal changes.(5) Lee stated that diabetics had higher central corneal thickness and it was significantly correlated with diabetic duration(>10 and <10 years) .(4)

Keolain et al (25)reported no significant differences in terms of function of the fluorescence permeability of the corneal thickness and endothelium, but endothelium were abnormal in diabetics as compared to normal persons ,thus pointing to structural disorder in diabetic corneal endothelium.Functional disorder of the diabetic corneal tissues can be caused by a stimulus like stress , trauma or from the lack of an adequate oxygen supply. It is thought that diabetes reduces the activity of Na⁺-K⁺ ATPase of the corneal endothelium, and this in turn causes morphological and permeability changes in the cornea. (10)

In a study conducted at Kudret eye hospital,Turkey,byAkinciA,it was concluded that diabetic patients have a significantly increased central corneal thickness compared with healthy subjects and current high HbA1c value which is a marker of metabolic control of the disease,predicts a higher central corneal thickness. (2)

According to the results of the present study, diabetic patients showed significant increase of central corneal thickness compared with normal persons, and it was found to more thick in diabetics with > 10 years duration . These results correlate with previous studies done worldwide. The study suggests that diabetics show thick corneas as one of the unnoticed signs for the diagnosis of the disease. Also ,diabetics with poor glycaemic control were found to have more thick corneas as compared to diabetics with good control.

The evaluation of endothelial density and CCT is important in various disorders such as glaucoma, dry eyes and diabetes mellitus,contact lens related complications . Outcomes of various intraocular surgeries includingcataract, keratoplasty, vitrectomy and refractive surgeries rely on the status of the cornea (27).

Therefore, in order to assess whether there is a correlation between corneal thickness and condition of the endothelium in diabetic patients, it is necessary to complement these findings with a parallel study of the corneal endothelium in these patients .

CONCLUSION

A significant correlation was found between increase CCT and diabetes, with positive correlation between thick cornea and the duration of the diabetes, indicating that patients with thick corneas are more likely to be found in an advanced stage of the disease. Measuring CCT in diabetic patients may help to identify those patients who are at higher risk of developing severe complications thus enabling the ophthalmologist to treat their disease more accurately.

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