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Research Article

CORNEAL ENDOTHELIAL EVALUATION IN RELATION WITH DIABETES MELLITUS

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A R T I C L E I N F O

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A B S T R A C T

Aim: To study relation between corneal endothelial cell density with duration and status of diabetes mellitus.
Material and Method: We randomly selected 500 cases of diabetes and 500 non diabetic patients age range from 35-70 yr. History of duration of disease and any associated diseases recorded. Endothelial cell density calculated by specular microscope. Fundus examination by indirect ophthalmoscopy after dilating pupil was done, ocular coherence tomography and fundus fluorescein angiography done when needed for assessing status of diabetic retinopathy.
Results: Mean endothelial cell density was 2056.23 in diabetics versus 2840.12 in controls. Mean endothelial cell density showed statistically significant decrease in diabetic patients. There is a negative correlation between duration of diabetes and endothelial cell density which is stastically significant. Mean endothelial cell density in diabetics with duration < 5 years were 2176.42; in 5-10 years were 1992.20, in 11-15 years: 2012.84, with 16-20 years: 2024.60 and > 20 years 1720.12. Mean endothelial cell density with no Diabetic Retinopathy was 2186.88, in diabetics with Non Proliferative Diabetic Retinopathy (NPDR) 1786.34 and with Proliferative Diabetic Retinopathy (PDR), it was 1608.96.
Conclusion: We found lower endothelial cell density with increasing severity of diabetes mellitus. Diabetes mellitus leads to decrease in endothelial cell density; affected by duration of Diabetes and severity of Diabetic retinopathy and hence needs endothelial evaluation as diabetic eye care protocol before any anterior segment intraocular surgeries.

INTRODUCTION

Diabetes mellitus is a syndrome characterized by inappropriate hyperglycemia and is chronically associated with micro vascular and/or macro vascular complications. Patients with diabetes mellitus often develop not only diabetic retinopathy but also corneal endothelial damage and keratoepitheliopathy such as superficial punctate keratitis, recurrent corneal erosion and persistent epithelial defects.[1-3]

Diabetic patients have a high risk of developing persistent stromal edema after pars plana vitrectomy or other intraocular surgical procedures.[4] This suggests that diabetic endothelial cells have functional and morphological abnormalities. Functional abnormalities may induce increased corneal auto fluorescence as measured by fluorophotometry[5,6] as well as increased corneal endothelial permeability[7],although some researchers have reported that corneal endothelial permeability is not increased.[5,6,8.]

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Morphological abnormalities may induce a high coefficient of variation of cell area and a decrease in the percentage of hexagonal cells in the corneas of diabetic patients compared with those of nondiabetic patients.[2,5,6,9-12] Regarding endothelial cell density in diabetic patients, one study has reported it to be decreased,[9] while others have reported that it is similar to values in nondiabetic patients.[2,5,6,8,10-14.]

MATERIAS AND METHODS

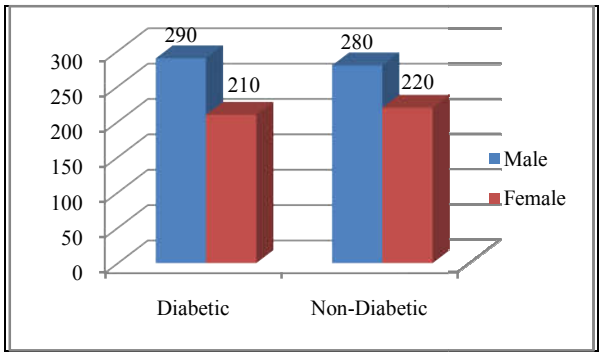
This was a cross sectional, case-control analytic study conducted in Government Medical College and hospital; Akola during October 2016 to February 2017.

Subjects

We examined 500 patients with diabetes (290 males 210 females) and 500 control subjects (280 males and 220 females) in this study.

The age range of diabetic group was 35-70 years; duration of diabetes was from 1- 30 years. All the diabetic patients were

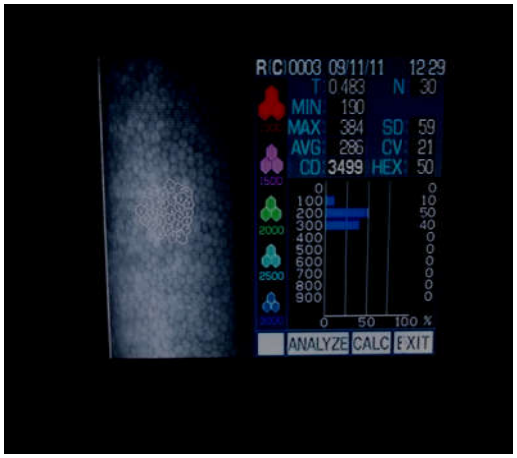
divided in 5 groups according to diabetes duration of < 5yr, 5-10 yr,11-15 yr, 16-20 yr, >20 yr.



Graph1 Subjects

Ophthalmologic examination included a complete medical history, visual acuity, intraocular pressure, slit-lamp examination, endothelial cell count and binocular indirect ophthalmoscopy fundus examination, ocular coherence tomography and fundus fluorescein angiography when needed. Those patients who had any type of diabetic retinal lesion were evaluated to diagnosis such lesions as normal fundus or as background diabetic retinopathy. Patients having a previous ophthalmic intervention, intraocular surgery, any major ocular disease, laser treatment current or past uveitis, high intraocular pressure and contact lens wearers, were excluded from the study.

Picture 1 specular microscope

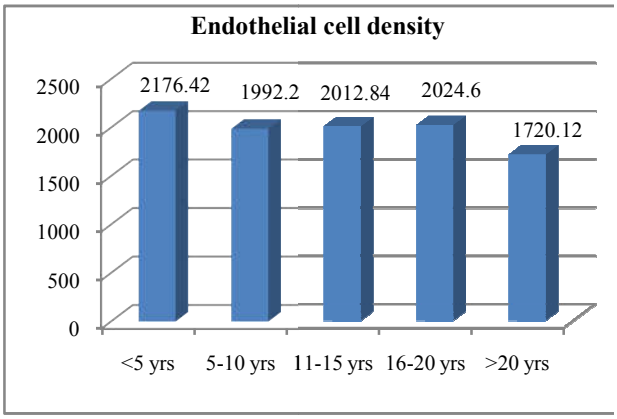


Picture 2 Endothelial cell density

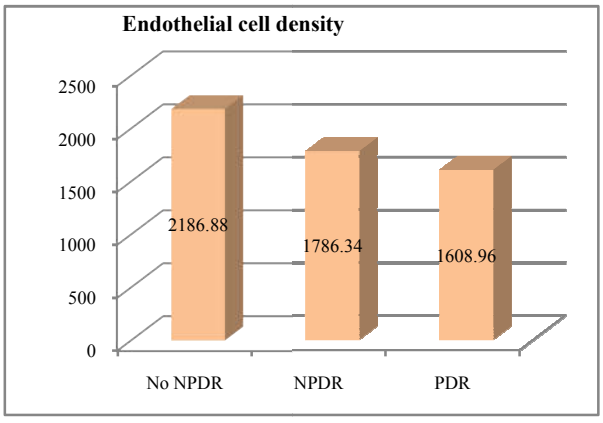
All patients who had any corneal pathology like corneal degenerations or dystrophies, previous corneal injuries, corneal scar were also excluded from study. All the patients with systemic illness other than diabetes are excluded from the study. Informed consent was taken from all participants before their inclusion in the study by providing details of study, Specular microscopy of the central endothelium was performed on both eyes by using a specular microscope (TOPCON SP2000p). This device autotracts the cornea and autofocuses on the endothelium without touching the cornea.

Picture 3 Indirect ophthalmoscopy

It also provides high magnification, good image quality and the capability for semi automated, computer-assisted cell density determination and morphometric analysis using the 'dot' method endothelial cell density calculated. From the data collected we evaluated ECD changes with Diabetic retinopathy (DR) and duration of diabetes.



Graph 2 Duration of diabetes & ECD



Graph 3 Status of DR and ECD

RESULTS

Mean endothelial cell density was 2056.23 in diabetics versus 2840.12 in controls. Mean endothelial cell density showed statistically significant decrease in diabetic patients. There is a negative correlation between duration of diabetes and endothelial cell density which is stastically significant.

Mean endothelial cell density(ECD) in diabetics with duration < 5 years were 2176.42; in 5-10 years were 1992.20, in 11-15 years: 2012.84, with 16-20 years: 2024.60 and > 20 years 1720.12. Mean endothelial cell density with no Diabetic Retinopathy (DR) was 2186.88, in diabetics with Non Proliferative Diabetic Retinopathy (NPDR) 1786.34 and with Proliferative Diabetic Retinopathy (PDR), it was 1608.96.

DISCUSSION

There are many reports about corneal endothelial structure in diabetic patients.[2,5-14] Schultz *et al* reported that in type II diabetic patients endothelial cell density was similar, coefficient of variation of cell area was increased, and percentage of hexagonal cells was decreased compared with nondiabetic patients.[2]

Larsson *et al* reported that the endothelial cell density, coefficient of variation of cell area, and percentage of hexagonal cells all were not significantly different between type II diabetic and nondiabetic patients.[6]

Roszkowska *et al*, however, reported in type II diabetic patients a decreased endothelial cell density, an increased coefficient of variation of cell area (polymegathism), and a decreased percentage of hexagonal cells (pleomorphism).[9]

In Japanese type II diabetic patients, Itoi *et al* [10] and Matsuda *et al* [11] have reported a similar endothelial cell density, an increased coefficient of variation of cell area, and a decreased percentage of hexagonal cells. Roszkowska *et al* observed cell density in type II diabetes was decreased at 5% and significantly lower than that in age-matched nondiabetic patients.[9]

There is a significant correlation reported between age,[6-12] duration of diabetes mellitus,[6,7,15] and endothelial cell density. It is thought that diabetes reduces the activity of Na^+-K^+ ATPase of the corneal endothelium, and this causes the morphological changes and permeability changes in the corneas, and then damages are caused as corneal compensation against the IOP.[2,8]

Keoleian *et al*.[17] reported that diabetic patients frequently had abnormal corneal endothelium in contrast to normal persons, but there were no significant differences in terms of function of the fluorescence permeability of the corneal thickness and endothelium. This means that the corneal endothelium of diabetic patients have a structural disorder, but the functional disorder of the corneal tissues is not affected. Ziadi *et al* reported that it took longer for diabetics to recover from damaged corneal tissues compared with normal persons. As the corneal endothelium of diabetic patients has a structural disorder, a functional disorder of the diabetic corneal tissues can be caused by a stimulus like stress or trauma to the corneal tissues or from the lack of an adequate oxygen supply.[12,14] Therefore, it is necessary to carefully observe functional disorders including disorders in the permeability of the corneal tissues when conducting ophthalmologic procedures such as cataract operations and PRP or when diabetics use contact lenses for a long period of time. In our study we found lower endothelial cell density with increasing severity of diabetes mellitus. Diabetes mellitus leads to decrease in endothelial cell density; affected by duration of Diabetes and severity of Diabetic retinopathy and hence needs endothelial evaluation as diabetic eye care protocol before any anterior segment intraocular surgeries.

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