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Central Corneal Thickness and Endothelial Cell Changes in Patients with Diabetes Mellitus - A Hospital-Based Comparative Study with Age-Matched Non-Diabetic Controls

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Abstract

Background: Diabetes mellitus is known to induce biochemical and structural alterations in the corneal endothelium, predisposing affected individuals to corneal decompensation. This study evaluated endothelial cell density (ECD) and central corneal thickness (CCT) in patients with type 2 diabetes mellitus (T2DM) compared to age-matched non-diabetic controls.

Methods: A hospital-based observational cross-sectional study was conducted on 94 eyes of 94 patients aged 45 - 65 years. Forty-seven diabetic patients and forty-seven non-diabetic controls were evaluated. Specular microscopy using Tomey EM-3000 was employed to assess ECD and CCT. Fundus examination was performed to grade diabetic retinopathy.

Results: Mean ECD was significantly lower in diabetic patients compared to non-diabetics (2519.5 ± 199.5 vs. 2563.8 ± 208.1 cells/mm^2; $p = 0.025$). Mean CCT was significantly higher in diabetics (545.1 ± 20.2 µm) than in non-diabetics (530.9 ± 12.9 µm; $p < 0.001$). Increasing severity of diabetic retinopathy was associated with progressive reduction in ECD and increase in CCT ($p < 0.05$).

Conclusion: Diabetes mellitus significantly affects corneal endothelial integrity and thickness. Routine corneal assessment in diabetic patients is advisable, particularly prior to intraocular surgical procedures.

Keywords: *Diabetes Mellitus; Corneal Endothelium; Central Corneal Thickness; Endothelial Cell Density; Diabetic Retinopathy*

Abbreviations

T2DM: Type 2 Diabetes Mellitus; ECD: Endothelial Cell Density; CCT: Central Corneal Thickness; DR: Diabetic Retinopathy

Introduction

Type 2 diabetes mellitus (T2DM) has reached epidemic proportions in India. Chronic hyperglycemia results in non-enzymatic glycation, oxidative stress, and endothelial dysfunction affecting multiple ocular structures, including the cornea. The corneal endothelium plays a crucial role in maintaining corneal transparency, and its compromise may lead to increased corneal thickness and edema [1,2].

Aim of the Study

This study aimed to evaluate corneal endothelial parameters in diabetics and correlate these changes with the severity of diabetic retinopathy.

Materials and Methods

This observational cross-sectional study was conducted at the Regional Institute of Ophthalmology, BMCRI. Ninety-four patients aged between 45 and 65 years were included, with evaluation limited to the right eye of each subject. Patients with prior ocular surgeries, corneal pathologies, glaucoma, contact lens usage, or systemic medications affecting tear film were excluded. Specular microscopy was performed using Tomey EM-3000 in automatic mode. Fundus examination was carried out after pharmacological dilation to grade diabetic retinopathy.

Results

Age and sex distribution were comparable between diabetic and non-diabetic groups, ensuring demographic homogeneity. The majority of diabetic patients had a disease duration of 3 - 10 years. Endothelial cell density was significantly reduced in diabetics, while central corneal thickness was significantly increased. A statistically significant association was observed between increasing severity of diabetic retinopathy and worsening corneal endothelial parameters ($p < 0.05$).

Discussion

The present study demonstrates a significant reduction in corneal endothelial cell density and an increase in central corneal thickness in diabetic patients. These findings are consistent with previous reports by Lee., *et al*. and Urban., *et al*. who attributed endothelial compromise to chronic hyperglycemia-induced oxidative stress [3,4]. The correlation between retinopathy severity and corneal changes suggests a shared microvascular pathology. Clinically, increased CCT may influence intraocular pressure measurements and surgical outcomes, emphasizing the need for preoperative corneal evaluation in diabetics.

Conclusion

Diabetes mellitus adversely affects corneal endothelial stability, resulting in reduced endothelial cell density and increased corneal thickness. Severity of diabetic retinopathy and longer disease duration exacerbate these changes. Regular monitoring of corneal parameters may help prevent postoperative corneal decompensation and improve surgical outcomes.

Conflict of Interest

The authors declare no conflict of interest.

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