CORNEAL ENDOTHELIAL CELL DENISTY AND MORPHOLOGY IN LOW AND HIGH MYOPIC EYES IN ADULT EGYPTIAN PATIENTS

Amr Abd El Azim Habib, Ibrahim Yehia Allam, Nada Medhat Gab Allah, Omar Mohamed Mohamed Abead Abou Madawy
Department of Ophthalmology, Faculty of Medicine, Alexandria University

Introduction

The corneal endothelium is a non-regenerative monolayer of hexagonal cells that plays a vital role in maintaining corneal transparency by regulating stromal hydration. Corneal endothelial cell density (ECD) and morphological characteristics, including the coefficient of variation (CV) and hexagonality (HEX), serve as key indicators of endothelial health. High myopia, defined as a refractive error of ≥-6.00 diopters and excessive axial elongation, has been associated with structural changes in the eye, potentially leading to endothelial dysfunction. Previous research suggests that high myopia may reduce ECD and alter endothelial morphology due to mechanical stress from globe elongation; however, findings have varied across different populations. Given the need for region-specific data, this study aimed to evaluate corneal endothelial parameters in Egyptian adults with low and high myopia, addressing gaps in the existing literature.

Aim of the Work

The primary objective of this study was to compare corneal endothelial cell density (ECD), coefficient of variation (CV), and hexagonality (HEX) between Egyptian adults with low myopia (<-6.00 diopters) and high myopia (≥-6.00 diopters). Additionally, the study sought to assess axial length, intraocular pressure (IOP), and fundus changes to explore possible associations between the severity of myopia and various ocular parameters.

Subjects and Methods

The study was a cross-sectional analysis conducted at Alexandria Main University Hospital from May to November 2023, involving 86 patients (172 eyes) aged 18–40 years. Participants were divided into two groups: 72 eyeswith low myopia and 84 eyeswith high myopia. To reduce confounding factors, patients with ocular diseases, prior eye surgeries, trauma, or contact lens use were excluded. All subjects underwent comprehensive eye examinations, including cycloplegic refraction, axial length measurement, fundus examination, IOP measurement, and corneal endothelial assessment (ECD, CV, HEX) via specular microscopy. Data analysis used Student's t-test for continuous variables and chi-square tests for categorical variables, with normality checked using histograms. The aim was to investigate the direct impact of myopia on the corneal endothelium.

Results

The study found that ECD was significantly lower in high myopic individuals (2550.4 ± 393.8 cells/mm²) compared to those with low myopia (2589.6 ± 227.3 cells/mm²), with a statistically significant p-value of 0.006. However, there were no significant differences between the two groups regarding CV (p=0.880) and HEX (p=0.720), indicating that endothelial cell uniformity and hexagonal morphology remained preserved regardless of myopia severity. Axial length did not show a statistically significant difference between studied groups (27.45 ± 1.95 mm vs. 24.33 ± 1.82 mm, p=0.506), potentially due to overlapping ranges or regional anatomical variations.

Fundus examination revealed myopic changes such as tessellation and chorioretinal atrophy exclusively in high myopes, consistent with the diagnostic criteria for pathological myopia. No significant differences were observed in age, sex distribution, or IOP, findings between the two groups, ensuring the comparability of the study cohorts.

Table 1: Optimal axial length cutoffs for clinical parameters.

Parameter	Optimal AL Cutoff (mm)	AUC	Sensitivity	Specificity	PPV	NPV	r	p
ECD < 2000	26.5	0.82	85%	78%	76%	86%	-0.71	<0.001*
CV% > 40	26	0.73	72%	68%	65%	75%	0.65	0.003*
HEX% < 50	25.8	0.70	65%	62%	58%	69%	-0.59	0.007*
Fundus Exam (abnormal)	26.2	0.75	74%	70%	67%	76%	0.62	0.005*
IOP >21 mmHg	26.3	0.78	78%	73%	71%	79%	0.6	0.006*

(AL) axial length; (ECD) endothelial cell density; (IOP) intraocular pressure; (AUC) area under the curve; (PPV) positive predictive value; (NPV) negative predictive value; (r) Pearson correlation; (p) probability value, (*) significant if ≤ 0.05.

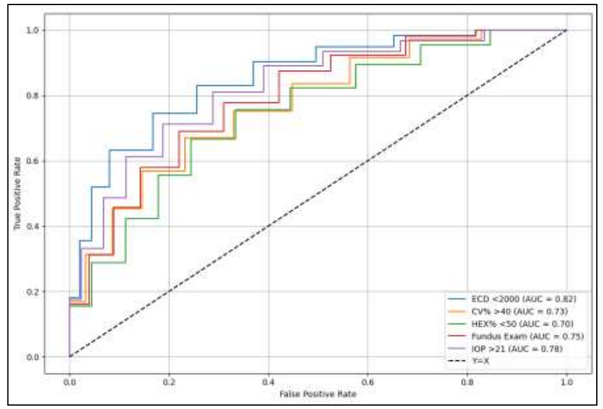

Figure 1: ROC curve analysis of axial length for clinical parameters in myopic eyes.

Conclusion

The findings of this study indicate that high myopia in Egyptian adults is associated with reduced corneal endothelial cell density while maintaining stable CV and HEX. These results contrast with some global studies that have reported endothelial polymegethism or pleomorphism in high myopes. The preservation of CV and HEX may be attributed to the younger age of the study population or potential ethnic variations in endothelial resilience. Additionally, the presence of significant fundus changes in high myopic individuals emphasizes the need for continuous retinal monitoring in this group. Although axial length did not show a significant difference between the two groups, cycloplegic refraction remained a reliable measure for stratifying myopia severity.