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Original Article

Evaluation of the relation between myopia and central corneal thickness in patients admitted to vali-e-asr hospital in birjand, iran

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Abstract

Introduction: Considering the increasing prevalence of myopia and the subsequent complications, and due to the dearth of studies on the correlation between myopia and gender with corneal thickness in Iran, this study aimed to determine this relationship in patients admitted to the ophthalmic clinic of Vali-e-Asr Hospital, Birjand, Iran.

Methods: This descriptive-analytic epidemiologic study was conducted on 100 patients admitted to Vali-e-Asr ophthalmic clinic in Birjand, Iran, for one year since January 2017. According to the degree of myopia, the patients were divided into three groups of low (0-3 D), moderate (3-6 D), and high myopia (6≤D). Corneal thickness was measured using Orbscan and Pentacam. The data were analyzed in SPSS software (Version 19) through ANOVA and T-test to determine the possible relationship between myopia and central corneal thickness. A p-value equal to and less than ($P \leq 0.05$) was considered statistically significant.

Results: Overall, 100 patients (49 males and 51 females) were enrolled in this study. Moderate myopia had the highest frequency in both eyes. The results of the T-test revealed that no significant difference was observed in the mean corneal thickness measured by Pentacam between the two genders ($P=0.18$ in the right eye and $P=0.32$ in the left eye). Based on the ANOVA findings, the mean corneal thickness measured by Pentacam was not significantly different among the myopia categories ($P=0.05$ in the right eye and $P=0.51$ in the left eye)

Conclusions: The study results revealed that there was no significant relationship between myopia and gender with corneal thickness.

Keywords: Corneal, Gender, Thickness Myopia

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Introduction

Myopia is a refractive error in the eye in which parallel rays of light coming toward a resting eye are focused in front of the retina (1). A variety of risk factors for myopia have been suggested. While myopia genetics had undergone considerable progress, no candidate gene has yet been discovered for familial myopia (2). Studies concerning environmental risk factors include reading and near work show rather more conclusive results (3-5).

Nonetheless, they are not devoid of controversy either (6). Although reports have an emphasis on Asia (7-8), a similar pattern of increase for myopia has been suggested in Europe and America as well (9-10). Trends predict that almost 50% of the world population will have myopia by 2050 (11).

Central Corneal Thickness (CCT) is one of the most critical indicators of corneal health. There have been studies attempting to investigate the association between myopia and low CCT; however, the results are rather conflicting. Therefore, this study aimed to assess the relationship between myopia and CCT with gender in patients who were referred to Vali-e-Asr Hospital ophthalmic clinic, Birjand, Iran.

Materials and Methods

This descriptive-analytic epidemiologic study was conducted on a total of 100 patients (49 males and 51 females) who were candidates for keratorefractive surgery and referred to the Vali-e-Asr ophthalmic clinic, Birjand, Iran from January 20, 2017, to January 20, 2018. Exclusion criteria included glaucoma, history of previous trauma or ocular surgery, keratoconus, ocular surface disease, corneal opacity, and contact lens use in the last two weeks. Written informed consent was obtained from all patients included in the study. The study protocol was approved by the Ethics Committee of Birjand University of medical sciences, Birjand, Iran (IR.BUMS.REC.1396.312). Myopic patients were divided into Group A (-0.5 to 3.00 diopter), Group B (3.00 to 6.00 D), and Group C (>6.00 D). This classification corresponded to those in similar studies (12). All patients underwent complete ocular examination, including visual acuity test, slit-lamp examination, cycloplegic refraction using tropicamide 1%, funduscopy, and intraocular pressure measurement. The CCT was measured using both Orb scan (Orbscan IIz) and Oculus Pentacam. Data were analyzed using SPSS software (Version 19).

Initially, the normality of quantitative data distribution was examined through the Kolmogorov-Smirnov test. Following the investigation of the normality of data distribution, independent t-test, ANOVA, and Welch's t-test were used for data analysis. A p-value less than 0.05 was considered statistically significant.

Results

The mean ± SD age of patients (n=100) included in this study was obtained at 27.45±5.98 years (the age range: 18-46 years), and the majority of patients (n=51, 51%) were female.

Both the right and left eyes of the patients were examined, and the majority of the eyes examined were in group B (56.5%).

Mean myopia in the total study population was determined at 4.39±1.91D. The mean myopia progression in male and female patients was determined at 3.8±1.82 D and 4.94±1.84 D, respectively, and it was decided that females had higher degrees of myopia ($P<0.001$). The mean CCT of patients measured by Pentacam and Orbscan was estimated at 520.01±31.01 and 520.55±36.42, respectively. The mean CCT was 516.27±33.8µm and 523.59±33.80µm in males and females, respectively. No significant difference was observed between the two methods of CCT measurement (i.e., Pentacam and Orbscan) applied on both genders ($P=0.09$ and $P=0.13$, respectively). Table 1 presents the comparison of demographic data, degree of myopia, and CCT of the patients of both genders.

As indicated from the data presented in Table 2 the mean CCT was higher in females than males in the three groups using the Pentacam method. The mean CCT was higher in group C than group B and in group B higher than group A. However, these differences were not significant between males ($P=0.12$) and females ($P=0.52$).

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In the Orbscan method, the mean CCT was higher in males in the C group (530.54±13.21) and females in the B group (525.98±28.13). However, these differences were not significant between males (P=0.19) and females (P=0.76). Therefore, it was concluded that CCT was not correlated with the degree of myopia in patients who were referred to Vali-asr Hospital, Birjand, Iran (P >0.05).

Table 1. Comparison of the demographic data, degree of myopia, and CCT of the patients in terms of gender.

Gender	**No. of patients**	**Age (year)**	**Degree of myopia (D)**	**CCT (µm)**	
				Pentacam	Orbscan
Male	49	26.31±6.43	3.80±1.82	516.27±33.80	516.61±40.94
Female	51	28.55±5.36	4.94±1.84	523.59±33.80	524.33±31.20
Total	100	27.45±5.98	4.39±1.91	520.01±31.01	520.55±36.42
p-value*			<0.001	0.09	0.13
Data are presented as n (%) or mean± SD unless otherwise indicated. D= Diopters					

*Independent sample t-test

Table 2. Comparison of CCT measurements between male and female participants in myopia groups

			Myopia groups			**p-value***
			Group A (-0.5-3 D) (n=47)	**Group B (3-6 D) (n=113)**	**Group C (≥6 D) (n=40)**	
CCT (µm, Mean± SD)	Pentacam	Male	509.42±38.73	517.28±32.50	533.27±10.59	0.12
		Female	515.00±21.51	524.75±27.72	524.72±30.23	0.52
	Orbscan	Male	507.46±47.05	519.82±39.61	530.54±13.21	0.19
		Female	519.16±41.11	525.98±28.13	523.00±33.67	0.76
Data are presented as mean± SD D= Diopters						

*One way ANOVA

Discussion

The results obtained in this study indicated that CCT was not correlated with the degree of myopia in patients who were referred to Vali-asr Hospital, Birjand, Iran. Seemingly, the cornea does not become thinner, as does the sclera in myopic eyes. The results obtained in the present study were consistent with the findings of most previous studies.

Despite the numerous similar studies abroad, to the best of our knowledge, only one study from Iran has addressed this issue. In a study conducted by Mortzavi (2006) in Isfahan, 112 patients (224 myopic eyes) were analyzed to determine whether there was a meaningful correlation between Myopia and CCT, following the LASIK surgery. The results indicated that the difference between the mean degree of myopia in males and females was not statistically significant (13).

Garcia-Medina et al. conducted a cross-sectional, descriptive, observational study on 310 myopic patients in the age range of 20-40 years (14). They investigated the relationship between CCT and the degree of myopia in myopic adult patients in Almería, Spain. They found no linear relationship between these two parameters, which was consistent with the results of the present study.

Similarly, Balwir et al. attempted to find the same correlation in a hospital-based cross-sectional

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observational study in Indian patients with myopia (15). In their study, they measured CCT and the degree of myopia in 138 patients (276 eyes). The Pearson correlation coefficient was obtained at 0.03, indicating a statistically significant correlation between CCT and the degree of myopia.

Another study performed in Egypt aimed to determine the relationship between CCT and myopia in 87 myopic patients and 21 healthy controls in the age range of 19-58 years (16). The myopic patients were divided into three groups of patients with myopia less than 5.00D; between 5.00D and 10.00D; and between 10.00D and 15.00D, respectively. Their results indicated no difference in CCT between emmetropic and myopic eyes (P>0.05).

Another cross-sectional study carried out by Al-Saffar et al. explored the possible association between central corneal thickness and degree of axial myopia (17). Their study included 100 patients (197 eyes) in the myopic group and 103 patients (203 eyes) in the emmetropic control group. Despite the significant difference in the mean CCT between the emmetropic and myopic groups, no significant correlation was observed between the two studied parameters.

A Taiwan-based study conducted by Chen et al. explored the correlation between CCT and the degree of myopia among 528 myopic adult patients (422 females and 106 males) (18). They failed to find any significant correlation between CCT and the degree of myopia.

Ortiz et al. analyzed the relationship between the CCT and mid-peripheral corneal thickness (PCT) with the degree of myopia (19). In their study, 175 myopic eyes from 175 patients were divided into three groups, according to their degree of myopia. The difference in CCT between the three groups was not statistically significant. They found no significant differences among low, moderate, and extremely myopic eyes related to the CCT and PCT.

A Nigeria-based study performed by Chinawa et al. found a statistically significant correlation between myopia and low CCT (12). They recruited 160 cases (320 eyes), including 80 cases with myopia and 80 controls. While the difference in CCT was statistically significant in myopes and controls, they did not find any correlation between myopia and CCT.

However, in contrast to the results of the present study and those mentioned above, either negative or positive correlations were observed in three other studies. The findings of a study performed by Mimouni et al., including the right eyes of 30,245 individuals, showed that CCT is correlated with the degree of myopia among adults (20). Younger individuals showed higher degrees of myopia, and there was a direct correlation between the degree of myopia and CCT. Consistently, the second study performed by Nemesure et al. reported a positive correlation between these two parameters as well. They found that CCT was positively correlated with the degree of myopia. however, the results of another study revealed a negative correlation between CCT and the degree of myopia.

The study by Chang et al. included 216 Taiwanese subjects with various refractive statuses, and the results suggested that the studied corneas had a mean±SD corneal thickness of 533±29 µm and were thinner in more myopic eyes. The inconsistencies between the results of the above-mentioned studies can be attributed to the retrospective nature of one study (Mimouni et al.), as well as the ethnic differences and dissimilar inclusion and exclusion criteria in different studies. Moreover, regarding the fact that CCT flattens gradually with age, the relatively young sample population in this study may have played a role here.

No significant dissimilarity was observed in the CCT between males and females in the present study. This has also been the subject of other studies, the results of which have been rather inconclusive. In line with the findings of the present study, the study performed by Linke et al. found no significant difference in CCT between both genders (6).

Zheng et al. measured central corneal thickness in Chinese children. Their results showed differences between the two groups. Although Corneal thickness was mostly thicker in boys, no such gender-related difference was not identified in adults (21).

Garcia-Medinaet al. conducted a similar study in

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Spain to determine the relationships among CCT, intraocular pressure, and degree of myopia in a myopic adult population. In contrast to the findings of the present study, their results suggested that the corneas of males were generally thicker than those of females (P=0.014) (22) which might be attributed to racial dissimilarities. In addition, myopic patients might believe that they were not eligible for PRK and refused to participate in this study as a result.

Regarding the limitations of the present study, one can refer to the fact that participants were mostly young and relatively healthy which could have affected the obtained results. Moreover, a small number of patients were referred to our medical center during the study period, which resulted in a small sample size in each of the subgroups. Therefore, the results of the present study may not be generalized to all populations.

Conclusion

The results of the present study revealed no significant correlation between CCT and myopia. It is suggested that more comprehensive studies in the future with larger sample size and broader age range of participants will provide more definite and conclusive results.

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Conflict of interest

There is no conflict of interest.

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