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Case Report

Extremely Thick Cornea with Normal Slit-scanning Tomographic Findings and Normal Corneal Endothelial Specular Microscopic Parameters

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Abstract

In this report, we present a 19-year-old female complaining of bilateral diminution of vision due to refractive error. The uncorrected visual acuity (UCVA) in the right eye (RE) was 0.3 with best corrected visual acuity (BCVA) to 1 in decimal by a refraction of -0.50 Ds -1.00 Dc x 15, while the UCVA in the left eye (LE) was 0.3 with best corrected visual acuity (BCVA) to 1 in decimal by a refraction of -0.75 Ds -1.00Dc x 164. Corneal tomography was performed for both eyes by slit-scanning Orbscan IIz and the patient was diagnosed as normal corneal tomography with symmetrical bowtie but Central corneal thickness and thinnest pachymetry were extremely high. Central corneal thickness was 696 µm in right eye and 690 µm in left eye with normal tomographical maps. Corneal specular examination was done by non-contact specular microscope to exclude any corneal endothelial abnormality and no abnormality was detected.

Keywords: *Thick Cornea; Corneal Tomography; Orbscan IIz; Corneal Endothelium; Corneal Specular Microscopy*

Introduction

The cornea is a crucial part of the optical system of the eye, which its condition is directly affecting the quality of eyesight. Evaluation of central corneal thickness and endothelial cell parameters is an integral part of functional and morphologic assessment of the cornea for diagnostic purposes or before surgical interventions [1].

Slit-scanning tomography has become a cornerstone procedure for anterior segment imaging, because it provides a lot of data about corneal pachymetry, front and back elevations [2].

Healthy corneal endothelial cells are essential for maintained corneal transparency [3]. Under normal conditions, cornea is in a state of relative dehydration. When corneal endothelial cells are in pathological conditions, they cannot maintain dehydration state and cornea will lose its transparency and corneal thickness increases [4].

The non-contact specular microscope is a useful instrument that has been introduced to objectively evaluate corneal endothelial morphology and central corneal thickness [5].

In this case report, we presented a case of extremely thick cornea with normal slit-scanning tomographic findings and normal corneal endothelial specular microscopic parameters.

Case Report

A 19-year-old female patient presented to the outpatient clinic of the Nourelain Center for Lasik and Corneal Surgeries, Tanta, Egypt. The patient complained of bilateral blurred vision due to bilateral error of refraction.

The uncorrected visual acuity (UCVA) in the right eye (RE) was 0.3 with best corrected visual acuity (BCVA) to 1 in decimal by a refraction of -0.50 Ds -1.00 Dc x 15, while the UCVA in the left eye (LE) was 0.3 with best corrected visual acuity (BCVA) to 1 in decimal by a refraction of -0.75 Ds -1.00 Dc x 164.

Slit-lamp examination (RM-8900, TOPCON, Japan) of the anterior segment was normal with bilateral normal corneal diameter (mm), normal scleral color, clear corneal stroma and no corneal scars or edema or endothelial abnormalities. No iris abnormalities or lens opacities were detected. The fundus examination was done for the patient and it was normal.

There was no positive family history of refractive errors, ectatic corneal disorders, associated skeletal deformities or systemic metabolic disorders like diabetes mellitus.

The patient sought refractive laser correction in our center. Corneal tomography was performed with slit-scanning tomography by Orbscan IIz (Bausch and Lomb, Rochester, NY) which revealed a symmetrical bow tie with extremely thick corneas.

Central corneal thickness was 696 µm in right eye and central corneal thickness was 690 µm in left eye with normal tomographical maps. The average keratometry was within normal range in both eyes (43.00D). Both front and back elevations were within normal range in both eyes. The white to white diameter was 12.40 mm in right eye and 12.30 mm in left eye (Figure 1A-1D).

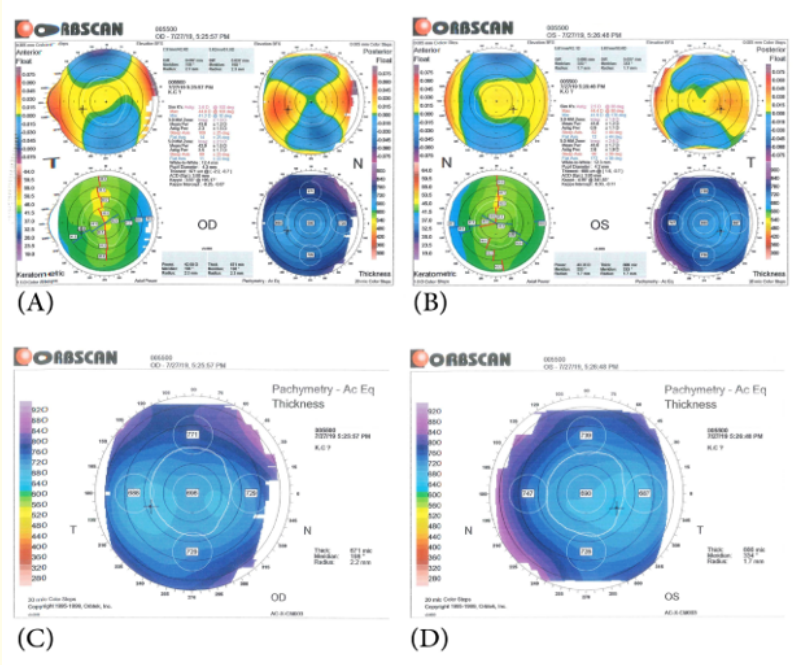

Figure 1: *A, B) Corneal tomography of both eyes by slit-scanning Orbscan IIz (Bausch & Lomb, Rochester, NY) C, D) Pachymetry map of both eyes.*

As regard the intraocular pressure it was normal in both eyes (right eye: 13 mmHg, Left eye: 14 mmHg) by applanation tonometry after adjusting the IOP results according to Doughty formula [6] due to this extreme corneal thickness.

Despite of normal slit lamp corneal examination and normal corneal tomography, we decided to do corneal specular examination to exclude any corneal endothelial abnormality. It was done by a non-contact specular microscope (Topcon SP-3000P Topcon Corp., Tokyo, Japan) which performed detailed corneal endothelial cell measurements.

The corneal endothelial cell measurements included central corneal thickness [645 µm in right eye and 640 µm in left eye], endothelial cell density [3184.2 cells/mm^2 in right eye and 3337.7 cells/mm^2 in left eye], corneal endothelial cell variation in size as the percentage of abnormal size (corneal polymegathism) [31.2% in right eye and 29.1% in left eye] and the corneal cell shape variation as a percentage of hexagonal cells (corneal pleomorphism) [64% in right eye and 69% in left eye]. The corneal endothelial cell measurements of both eyes were normal (Figure 2A and 2B).

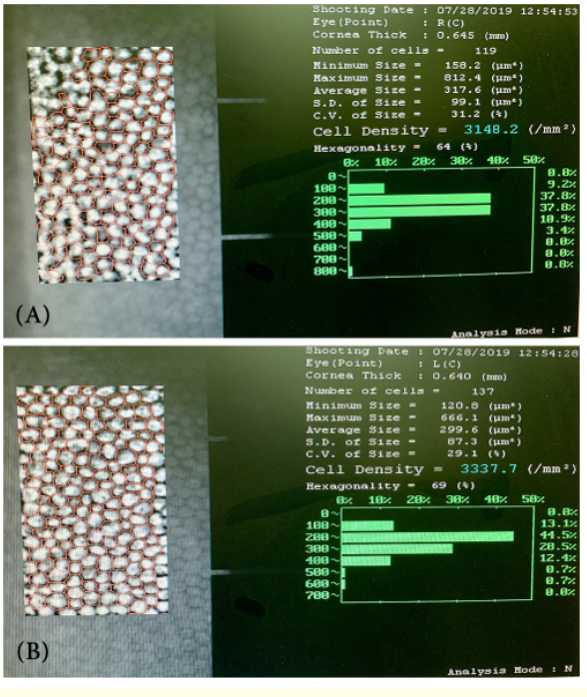

Figure 2: *Corneal endothelial cell measurements of both eyes by non-contact specular microscope (Topcon SP-3000P Topcon Corp., Tokyo, Japan). A) Right eye B) Left eye.*

All measurements of both eyes were summarized in table 1.

	Right eye	Left eye
Cell density (cells/mm^2)	3184.2	3337.7
Coefficient of variance (polymegathism) %	31.2%	29.1%
Hexagonality (Pleomorphism) %	64%	69%
Central corneal thickness, in micron	645 um	640 um

Table 1: *Measurements of corneal endothelial cell parameters.*

A written informed consent was gathered from the patient to publish this case report and to publish the images of her investigations.

Our decision was to postpone refractive surgery and to follow up the patient for one year to exclude any possibility of any pathological progression later on.

Discussion

The corneal endothelium acts as a barrier which limits free diffusion of large molecules between the aqueous humor and corneal stroma and a pump the excess water from the stroma and maintain the cornea with a stable thickness. Estimates of endothelial cell density (ECD) have been performed to evaluate the health of the cornea, especially before surgical intervention [7,8].

In our case, the central corneal thickness was extremely high in both eyes (696 μm in right eye and 690 μm in left eye). However; no slit-lamp findings of corneal edema or endothelial abnormalities were detected so, we decided to do corneal specular examination to diagnose any subtle endothelial pathological changes.

All corneal endothelial cell measurements were in normal limits with high central corneal thickness in both eyes.

To our knowledge, it is the first reported case of markedly thick normal cornea with no detected ectatic changes by corneal tomography and normal corneal specular examination.

In a study of Hoffmann EM., *et al*. [9] they evaluated the distribution of CCT in a large German cohort and analyzed its relationship with intraocular pressure and further ocular factors. They found that the normal mean (± standard deviation) central corneal thickness was 557.3 ± 34.3 μm (male) and 551.6 ± 35.2 μm in female subjects.

Also, in a study of Galgauskas S., *et al.* [10] they estimated the mean CCT and determined whether there were any correlations between CCT, age and sex in the adult Lithuanian population. They found that mean (± standard deviation) central corneal thickness for both eyes was 544.6 ± 30.5 μm. And it was 545.0 ± 25.6 μm in men and 544.4 ± 33.5 μm in women.

Suzuki S., *et al*. [11] investigated the distribution of central corneal thickness and factors correlating with central corneal thickness in a large-scale population of normal Japanese persons with no ophthalmological abnormality. They found that mean (± standard deviation) central corneal thickness was 517.5 ± 29.8 μm and was greater in men (521.5 ± 30.3 μm) than in women (514.4 ± 29.0 μm).

All the previous 3 studies of these 3 different populations showed that the mean upper limit of central corneal thickness doesn't exceed 590 um which indicate the rarity of our reported case.

Various factors can affect central corneal thickness in the general population, such as age, gender, genetic factors and race. The Ocular Hypertension Treatment Study demonstrated a correlation between high mean central corneal thickness and younger age, female gender, and diabetes [12]. In contrast, many other studies found a correlation between high central corneal thickness and male gender and older age [13,14].

We decided to postpone refractive surgery with longer period follow up of the patient to exclude any possibility of any pathological progression which can occur later on, especially with this young age of the patient.

Conclusion

Extremely thick cornea with normal clinical and tomographic features is an extremely rare condition. Non-contact specular microscopy is essential tool to exclude any subtle corneal endothelial abnormality.

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