Original article

Toris K Silicone Hydrogel Contact Lens for the Optical Management of Keratoconus

(Keratokonusun görsel rehabilitasyonu için Toris K silikon hidrojel kontakt lens)

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ÖZET

Amaç: Keratokonus hastalarının görsel rehabilitasyonunda Toris K silikon hidrojel lensinin etkinliğini değerlendirmek.

Materyal ve Metot: Retrospektif çalışmaya 58 hastanın 100 gözü dahil edildi. Hastaların ortalama yaşı 27,04± 9,5 yaş (aralık: 13-55) idi ve 15 göz grade 1, 28 göz grade 2, 13 göz grade 3, 44 göz grade 4 keratokonus idi. Düzeltilmemiş en iyi görme keskinliği, gözlükle düzeltilmiş en iyi görme keskinliği, korneal topografik ölçümler ve pakimetrik değerler kayıt edildi. Ortalama korneal kırıcılık 50,84±4,36D (aralık:43,40-60,90). Kontakt lens uygulandıktan sonra görme keskinlikleri ve değişimler kayıt edildi. Tüm hastalar için izlem süresi 1 yıl idi.

Bulgular: Ortalama düzeltilmemiş görme keskinliği (DGK) 0,80±0,40 logMAR (aralık: 0,1-2) idi. Ortalama gözlükle düzeltilmiş en iyi görme keskinliği (GDGK) 0,46±0,26 logMAR (aralık: 0,1-1,3) idi. Ortalama kontakt lensle düzeltilmiş en iyi görme keskinliği (KLDGK) 0,14±0,11 (aralık: 0-0.5) idi. Ortalama görme keskinlikleri gözlüğe kıyasla kontakt lensle daha iyi idi (p<0,01). Snellen eşelinde ortalama sıra artışı 3,83±1,36 (aralık: 1-7) idi. 83 gözde, Snellende 3 ya da daha fazla sıra artışı oldu. İzlem süresi boyunca herhangi bir komplikasyonla karşılaşılmadı.

Sonuçlar: Her evre keratokonusun görsel rehabilitasyonunda, Toris K silikon hidrojel kontakt lens kullanımı ümit verici bir alternatiftir.

Anahtar Kelimeler: Silikon hidrojel; keratokonus; kontakt lens

ABSTRACT

Background: To determine the efficiency of the Toris K silicone hydrogel contact lens for the optical management of keratoconus.

Material and Methods: 100 eyes of 58 patients were included in this retrospective study. Mean age was 27.04±9.5 year (range: 13-55) and 15 eyes were grade 1, 28 eyes were grade 2, 13 eyes were grade 3, 44 eyes were grade 4 keratoconus. Uncorrected visual acuity, best spectacle corrected visual acuity, corneal topographic measurements and pachymetric values were recorded. Mean corneal power was 50.84±4.36 D (range: 43.40-60.90). After contact lens fitted we checked visual acuity and recorded the difference. Follow up time was a year for all patients.

Results: Mean uncorrected visual acuity (UCVA) was 0.80±0.40 logMAR (range: 0.1-2). Mean best spectacle corrected visual acuity (BSCVA) was 0.46±0.26 logMAR (range: 0.1-1.3). Mean contact lens corrected visual acuity (BCLCVA) was 0.14±0.11 (range: 0-0.5). Mean visual acuities were better with contact lens then spectacles corrections (p<0.01). Mean line gain was 3.83±1.36 (range: 1-7) on Snellen. 83 eyes gained three or more lines on Snellen. We do not have any complications on follow-up time.

Conclusions: Toris K silicone hydrogel contact lenses are a promising alternative for the optical management of all grades of keratoconus.

Key Words: Silicone hydrogel; keratoconus; contact lens

INTRODUCTION

Keratoconus is a non-inflammatory disorder characterized by progressive corneal steepening, most typically inferior to the center of the cornea, with eventual corneal thinning, induced myopia, and both regular and irregular astigmatism. These corneal changes may reduce visual acuity of the patient[1,2]. It is generally a bilateral process; however it presents and develops asymmetrically[3].

The cause of keratoconus is unknown but the aetiology of the disease is multifactorial and it has been associated with genetic inheritance, atopic disease, eye rubbing and contact lens wear[4-6].

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More recently; computerized videokeratoscopes are the most sophisticated devices to confirm the diagnosis of keratoconus.

In early stages of keratoconus, spectacles may improve vision but myopia and irregular astigmatism are advanced as the disease progress. Finally a spectacle is no longer acceptable to the patient. Rigid gas permeable contact lenses or silicone hydrogel soft contact lenses may be the option for visual rehabilitation of these patients.

The purpose of this study was to determine the efficacy of silicone hydrogel contact lens for the optical management of patients with keratoconus.

MATERIAL and METHODS

In this retrospective study, 100 eyes of 58 keratoconus patients (28 female, 30 male) were

selected for investigation. This study was performed in accordance with the Declaration of Helsinki and written informed consent was obtained from all the subjects before inclusion.

The patients were examined by experienced clinicians and were diagnosed as keratoconus according to clinical findings (such as corneal thinning, cone-like shape deformity, Vogt's striae, Munson's sign, Fleischer's ring, Rizutti's sign), refractive findings and corneal topography data. All the patients underwent complete ophthalmologic examination including manifest refraction, best spectacle visual acuity (BSCVA), slit-lamp biomicroscopy, and corneal topography analysis (EyeSys Vision, Houston, TX). Visual acuities were measured with standard Snellen chart.

There is no generally accepted classification system for keratokonus but one of the most common is Amsler-Krumeich classification and it based on corneal radius, corneal thickness, diopters of myopia-astigmatism and corneal opacities. We used this classification for our study. (Table 1).

Table 1. Amsler-Krumeich Classification System for Keratoconus

Stage 1 Excentric corneal bulging Myopia and/or astigmatism <5D Corneal radius < or = 48 D Vogt's striae, no corneal opacities	**Stage 3** Myopia and/or astigmatism > 8,< 10 D Corneal radius > 53 D No central opacities Pachymetry: 200-400 µm
Stage 2 Myopia and/or astigmatism >5,<8 D Corneal radius < or = 53 D No central opacities Pachymetry > or = 400 µm	**Stage 4** Refraction impossible to determine Corneal radius > 55 D Central scars Pachymetry< 200 µm

D: diopter, µm: micrometers.

In this study, mean age was 27.04±9.5 year (range: 13-55). 15 cases were grade1, 28 cases were grade2, 13 cases were grade3, 44 cases were grade4 keratoconus. Mean flat meridian diopter (K1) was 47.65±4.20D (range: 40.30-58.40), mean steep meridian diopter (K2) was 54.03±4.80 D (range: 46.00-69.40) based on reading on corneal topography. Mean K values (K) were calculated with K1 and K2 reading on corneal topography and was 50.84± 4.36 D (range: 43.40-60.90) (Table 2). Mean pachymetric value was 482±36 micrometers (range: 384-510).

Toris–K soft keratoconus contact lens (Swiss-Lens, Prilly, Switzerland), a newly designed silicone hydrogel (Si H) lens with geometry of spherical with aspheric flattening, front toric surface. These contact lenses use dynamic stabilization system with bumps 0° and 180° engraved points. After we fitted the contacts, we use slit lamp to examine the locations of bumps on cornea. If stabilization bumps were not at the 0° and 180° of axes, we tried different base curve. We did not have any fitting problem in this study.

All the statistical analyses were performed using Statistical Package for Social Sciences software version 17.0 (SPSS Inc., Chicago, IL, USA). The results were analyzed using paired sample t test and regression analysis. The p-value less than 0.05 was considered as statistically significant.

RESULTS

Mean flat meridian diopter (K1) was 47.65± 4.20 D (range: 40.30-58.40), mean steep meridian diopter (K2) was 54.03±4.80 D (range: 46.00-69.40) based on reading on corneal topography. Mean K values (K) were calculated with K1 and K2 reading on corneal topography and was 50.84± 4.36 D (range: 43.40-60.90) (Table 2).

Mean UCVA was 0.80±0.40 logMAR (range: 0.1-2). Mean BSCVA was 0.46±0.26 logMAR (range: 0.1-1.3). Mean CLBCVA was 0.14±0.11 logMAR (0-0.5) (Figure 1). Mean line gain with contacts as against spectacle corrections was 3.83±1.36 on Snellen chart (range: 1-7). 83% of all cases gained 3 or more lines (Table 3). Mean line gain was 3.26±1.28 (range: 1-5) for grade1; 4.18± 1.39 (range: 1-6) for grade2; 3.50± 0.53 (range: 3-4) for grade3; 4.00±1.38 (range: 2-7) for grade 4. All stage groups were compared each other.

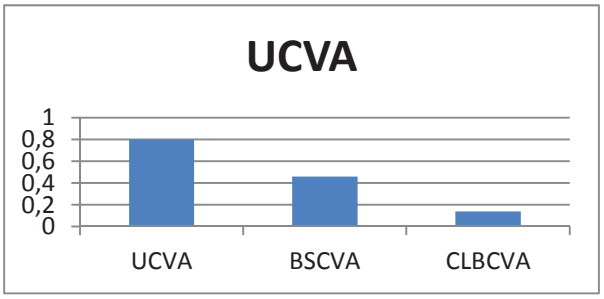


Figure 1. Mean UCVA, BSCVA, CLBCVA (logMAR)

Table 2. Corneal Topographic Measurements of Patients

	Minimum (D)	Maximum (D)	Mean±SD
Flat meridian (K1)	40.30	58.40	47.65±4.20
Steep meridian (K2)	46.00	69.40	54.03±4.80
Mean K (K)	43.40	60.90	50.84±4.36

D: diopter, SD: standard deviation

Only difference was recorded in grade 1 and grade 2 groups. Line gain was higher in grade 2 group against grade 1 group ($p<0.05$). CLBCVA was statistically better than BSCVA ($p=1.92$).

Table 3. Line Gains with Contact Lens Against Spectacle Correction

	Frequency (also %)
1 line	5
2 lines	12
3 lines	22
4 lines	30
5 lines	19
6 lines	11
7 lines	1

DISCUSSION

Keratoconus is a complex disorder with a large variety of associated factors and conditions. Several cases of familial transmission have been reported[7-8]. The diagnosis of mild or early keratoconus can be challenging but recent advances in computerized corneal topography have made it much easier to establish a diagnosis[10].

The first topographic change evident in keratoconus is inferior corneal steepening. The cone steepens as the condition progresses[9-10].

Also automatic screening programs to detect keratoconus topography patterns have been devised[12].

From the patient`s perspective, keratoconus is primarily a visual disorder. The primary goal of all treatment is to provide adequate vision. The treatment of keratoconus can be divided into two categories: surgical and non-surgical. The non-surgical management is essentially refractive. When spectacles no longer provide adequate vision, contact lenses are an effective therapeutic option for a majority of patients with keratoconus. A variety of contacts have been used including scleral and corneal lenses, rigid, soft and hybrid lenses or piggyback designs[12-14].

In our study we find out that fitting of a Toris K soft keratoconus lens improved visual acuity. Contacts lens corrected visual acuities was statistically better than spectacles corrected visual acuities ($p=1.92$) and these results show us contacts are better for visual rehabilitation of patients with keratoconus. 83% of all cases gained 3 or more lines with contact lens corrections in comparison with spectacle correction. Contacts also improved visual acuities in all grades of keratoconus. All cases could tolerate their contacts and we did not have any complications.

Result of another contact lens study, which made by Tuncer et al. and published in 2012, presented similar results with our study. They found that contact lens is useful for visual management of patients with keratoconus and it should be tried before kornea transplantation[15]. Other studies show us these kinds of contacts can also use for therapeutic purpose[16] and management of corneal astigmatism after corneal transplantation[17].

In Yelda et al.'s study, best-corrected spectacle visual acuity of 20/40 or better was noted in 12.5% of eyes before the SoftPerm contact lens trial and increased to 83.3% after the SoftPerm contact lens fitting. Lens damage especially related to separation at the junction was observed in 29.1% of patients, discomfort in 29.1%, giant papillary conjunctivitis in 25%, and peripheral corneal neovascularization in 25%. Discomfort was the most common reason for discontinuation[17].

In conclusion, we believe that silicone hydrogel soft contact lens is a viable alternative for optical management of keratoconus before the surgical treatments. Future studies should be performed on a large population of patients and longer period of time.

Confinct of interest statement none declared.

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