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Case Report
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Changes in Corneal Curvature and Pachymetry after Daily Use of a Scleral Contact Lens with a Late Postoperative of Radial Keratotomy: Case Report

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Abstract

Purpose: To report a challenging case of scleral contact lens use in a patient who received Radial Keratotomy (RK).

Observations: A 61-year-old-man had received surgery with RK more than 30 years ago. He developed a progressive corneal flattening with progressive hyperopia and astigmatism in both eyes. A Scleral Contact Lens (SCL) was fitted in both eyes in order to maintain the independence of the glasses and greater visual quality. After two months of daily SCL use, the patient returned with poor visual acuity in the left eye. On ophthalmological examination, a reduction in best corrected visual acuity in the left eye was noted from 20/30 to 20/200 using SCL, with an over refraction of -2.50 in the same eye. Changes in corneal curvature and thickness of both eyes were observed in Pentacam exam, with peripheral corneal edema near some radial incisions.

Conclusion: The continued use of SCL in patients after RK can cause changes in corneal thickness and curvature. Therefore, constant monitoring and follow-up of these cases is very important.

Keywords: Scleral contact lens; Scleral lens; Radial keratotomy

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Introduction

Radial Keratotomy (RK) was one of the first and most commonly performed refractive surgical procedures of the 20th century [1]. However, a wide spectrum of complications including cumulative hyperopia, irregular astigmatism, diurnal refractive instability, and uncorrectable decrease in visual acuity resulted in eventual decreased use of this technique as an effective option [2-4]. For these patients, spectacles and soft contact lenses offer only limited correction of irregular astigmatism, as they cannot neutralize the corneal irregularities [5].

Scleral Contact Lenses (SCL) are described as a treatment that can restore visual function without the risks and unpredictability of additional surgery in cases with a history of radial keratotomy [6-9]. The SCL are large-diameter, rigid, gas-permeable devices that are completely supported by the sclera and that vault the cornea and limbus. They maintain a fluid reservoir in the space between the posterior surface of the lens and the anterior surface of the cornea [10]. The unique fitting characteristics of SCLs enable the exchange of an irregular corneal surface for a regular surface, providing an excellent visual acuity and continuous hydration of the cornea [11,12].

Although there have been several reports of fitting the scleral lenses on irregular corneas after RK,5,6,8,9 there is no published report that focused on the instability of the cornea during the SCL use. Thus, our case report aimed to demonstrate changes in corneal curvature and pachymetry after daily use of the SCL in a patient with a late postoperative RK.

Case Presentation

A 61-year-old man, natural and from São Paulo, executive, without pathological background, presented to our clinic due to progressively decreased vision in both eyes. He wished to improve the quality of vision and be independent of glasses.

His medical history revealed that he had received bilateral RK at age 28 for uneventful correction of myopia in Both Eyes (BE). He was independent of the glasses for 10 years. At age 38 (1997), he evolved with progressive hyperopia and astigmatism in BE, secondary to progressive corneal

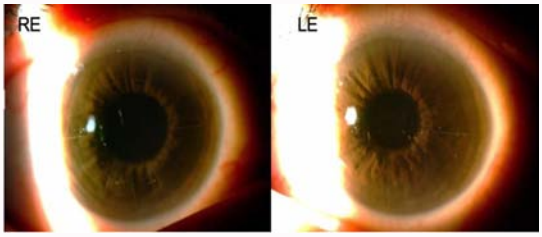

Figure 1: Right eye (RE) and left eye (LE) at the bio-microscopy exam.

flattening.

The patient reported that he had had difficulties adapting with rigid corneal contact lenses in recent years, and that the gelatinous contact lenses did not offer a quality vision.

In the current consultation (2020), the refraction was +3.25 DE in the Right Eye (RE) and +2.75 DE -1.25 DC 25° in the left eye (LE) with add +3.00 DE. The Best Corrected Visual Acuity (BCVA) with glasses was 20/30 in the Right Eye (RE) and 20/40 in the Left Eye (LE).

In bio-microscopy he presented eyelids and eyelashes with no changes, clear conjunctiva, transparent cornea, with 6 radial scars in the RE and 4 radial scars in the LE. The scars were closed, and affected anterior and middle stroma, with no visible signs of corneal edema (Figure 1). It showed signs of blepharitis and meibomitis. Absence of cataract in BE.

The tonometry was 12 mmHg in BE. Fundus exam found a well-attached retina and pinkish optic disc in BE. Imaging tests were performed, using the Pentacam, to evaluate corneal curvature and thickness.

In order to improve visual quality and reduce eyeglass dependency, the patient was referred for contact lens testing.

Rigid Gas Permeable (RGP) contact lenses were tested: Aspherical (Solótica), Ultraflat (Ultralentes), Planex 100 (Optolentes) and Esclera (Mediphacos) in this order.

The best fitted lens was the Esclera Scleral Contact Lens (SCL). It is a SCL, which vaults the cornea and limbus and rests entirely on the sclera. The space created by the vault of the Esclera is filled with preservative saline solution, which is placed in the lens reservoir at the time of insertion. This saline solution remains in contact with the cornea for the entire time of use, and the lens does not move, so there is no tear exchange. The Esclera lens has a diameter ranging from 16 mm to 18.2 mm and is specifically manufactured from a rigid, gas permeable material that is transparent and non-fenestrated and has a plasma-treated surface and outstanding oxygen permeability (141 Dk using the ISO/Fatt method), the Boston XO2.

For the Esclera lens fitting process, the suggestions of the manufacturing guide provided by the company were followed. The parameters evaluated were: Sagittal height between 200 to 300 microns, absence of corneal and limb touch, absence of mobility, absence of compression of the conjunctival vessels in the four quadrants.

The parameters of the best fitted lens were:

Right eye: Esclera SCL (Mediphacos); Base curve: 7.50; Power: -10.00 DE; Diameter: 16.5/9.5 mm; SAG: 4.75; Dk: Boston XO.

Left eye: Esclera SCL (Mediphacos); Base curve: 7.03; Power:

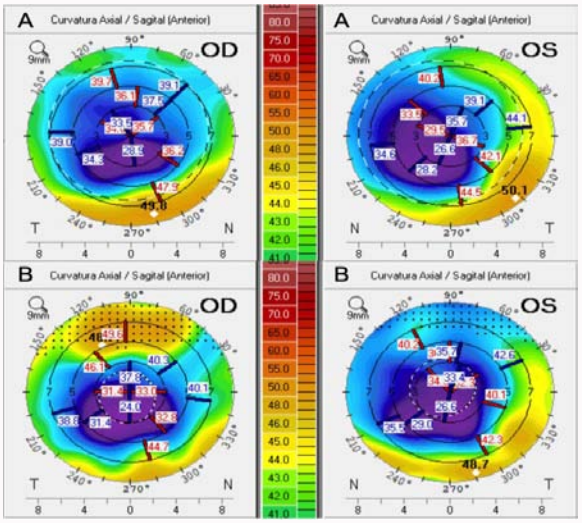

Figure 2: Pentacam images showing keratometric map from before (A) and after (B) the scleral contact lens use.

-15.00 DE; Diameter: 16.5/ 9.5 mm; SAG: 4.83; Dk: Boston XO.

Thus, the scleral lenses were prescribed bilaterally, with the best visual acuity of 20/30 in BE (with lenses). For near reading, glasses of +3.00 BE were prescribed.

In addition, treatments for blepharitis and meibomitis were performed, with recommendations for daily hygiene of the eyelashes with neutral shampoo and lubricant eye drops.

On the return after two weeks from the beginning of the use of the lenses, the patient reported satisfactory vision with the daily use of SCL for 10 hours a day.

Nevertheless, after 2 months of wearing the lenses, the patient returns reporting worsening of the far vision in the LE throughout the day, concomitantly with improved near vision in the same eye.

At exam, the visual acuity with the lenses was 20/30 in the RE and 20/200 in the LE. In bio-microscopy the eyes were calm, without hyperemia, transparent cornea and no opacities that would justify the Low Visual Acuity (LVA). The radial scars in the cornea were kept closed and int-altered. The fundoscopy also showed no alteration that would justify the LVA.

In the examination with the SCL, a suitable settlement was noticed, with SAG of approximately 150 µm, absence of touch in the cornea, absence of mobility, and absence of compression in the four quadrants of the conjunctival periphery.

An over refraction was then performed, with the presence of scleral lenses in use: RE: plane and LE: -2.50.

Image tests were again requested to evaluate the pachymetry and curvature of the cornea through the Pentacam. For better comparison of the images of the Pentacam before and after the use of the scleral lenses, the differential image map was used (Figure 2 and 3).

In the differential map was noticed a change in the initial curvature of the cornea after the constant use of the lens, with the keratometry varying from 31.1 × 34.1 to 30.8 × 32.1 in the RE and 31.3 × 32.5 to 30.3 × 32.0 in the LE. In addition, the corneal thickness at the pupil center ranged from 550 µm to 584 µm in the RE, and from 536 µm to 558 µm in the LE. The corneal thickness at the thinnest point ranged

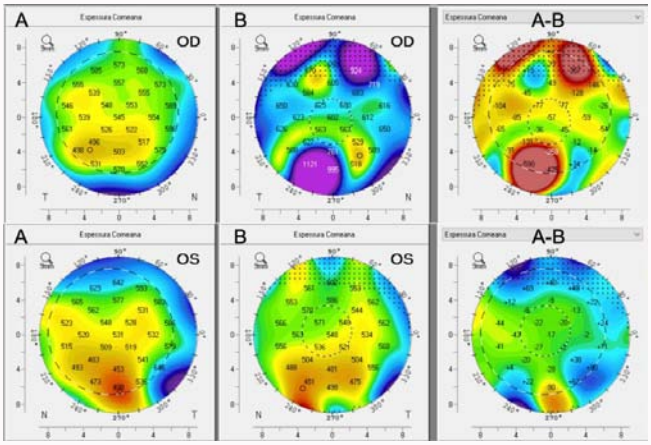

Figure 3: Pentacam images showing differential pachymetry map (A-B) from before (A) and after (B) the scleral contact lens use.

Table 1: Pentacam measures before (A) and after (B) the scleral contact lens use and the differential value between both (A-B).

	Right Eye			Left Eye		
	A	B	A-B	A	B	A-B
K1 (D)	31.1	30.8	0.4	31.3	30.3	1
K2 (D)	34.1	32.1	2	32.5	32	0.6
Mean K (D)	32.5	31.4	-	31.9	31.1	-
AST (D)	3	1.3	1.6	1.2	1.7	-0.4
Axis (Degrees)	12.1	27.1	-15.1	7.7	170.5	-162.8
Pachy Pupil Center (µm)	550	584	-34	536	558	-22
Pachy Min (µm)	485	491	-6	405	442	-38
Ant Ch Vol (mm^3)	230	209	21	262	186	76
ADC (mm)	3.89	3.68	0.2	3.94	3.53	0.41

K1: Flat Meridian Curvature; K2: Steepest Meridian Curvature; Mean K: Mean Keratometry; AST: Corneal Astigmatism; Pachy Central: Corneal Thickness at the Pupil Center; Pachy Min: Corneal Thickness at the Thinnest Point, Ant Ch Vol: Anterior Chamber Volume; ACD: Anterior Chamber Depth

from 485 µm to 491 µm in the RE and 405 µm to 442 µm in the LE. The Anterior Chamber Depth (ACD) ranged from 3.89 mm to 3.68 mm in the RE, and from 3.94 mm to 3.53 mm in the LE (Table 1).

Therefore, it was decided for this case the temporary suspension of contact lenses for 15 days, released only for sporadic use interspersed with glasses. In addition, control of the patient's returns was performed to assess the curvature and thickness of the cornea with Pentacam.

Discussion

The SCL are a good treatment option for irregular corneas available in recent years. Increasingly studies exhibit its use in late RK postoperative patients [5-9]. Despite this, it is still unknown the possible consequences and complications of the continuous use of these lenses in RK patients. To the best of our knowledge, there is no previous record in the literature about the changes caused by SCL in post-RK patients.

Diurnal refractive instability is a late complication of RK along with progressive hyperopia. Patients with RK are typically unsatisfied with spectacle or soft contact lens correction due to corneal irregularity. Corneal RGP lenses are typically unstable, and for that reason, are poorly tolerated [5,8,9]. A scleral lens is a good solution to the challenges these corneas present [6,7,9-11]. The fluid reservoir under the optic portion of a SCL neutralizes the front surface refractive error that is subject to mechanical or hydration factors, eliminating diurnal fluctuation [6]. In our opinion, the constant hydration of the corneal incisions generated by the fluid located below the SCL was crucial to cause hydration of the peripheral corneal stroma and a consequent edema in the areas already shown.

According to this case report, a SCL was fitted with an excellent visual result, illustrating the added value of specialty contact lenses as an alternative to surgery in the management of irregular cornea. Nevertheless, after 2 months of wearing the lenses, the patient showed changes in corneal curvature and pachymetry in both eyes; resulting in a refractive change and reduced visual acuity in the LE.

The corneal edema caused by the use of the SCL was greater at the periphery of the cornea, coinciding with the location of some RK incisions. This peripheral corneal edema caused a central flattening, demonstrated in the exams by the reduction of the ACD in both eyes (Table 1). The increase in the peripheral curvature of the cornea may justify the myopization of the left eye, which changed the refraction to -2.50 spherical diopters.

The changes in curvature and pachymetry evidenced in both eyes by the Pentacam exam, prove that even the right eye, which did not present a reduction in visual acuity, had significant changes after the SCL use. This particular case suggests that there may be subclinical changes in corneal topography and pachymetry in RK postoperative using SCL. Further studies are needed to clarify the possible changes caused to the cornea by the SCL in patients with RK scarring. Moreover, constant monitoring and follow-up of these cases is very important.

References

1. Ellis W. A textbook of radial keratotomy and astigmatism surgery. Irvine, CA: KC Terry; 1986.
2. Hoffmann F, Schuler A. Indications, results, and complications of refractive corneal surgery with mechanical methods. Curr Opin Ophthalmol. 1995;6(4):67-72.
3. Marmer RH. Radial keratotomy complications. Ann Ophthalmol. 1987;19(11):409-11.
4. Rashid ER, Waring GO 3rd. Complications of radial and transverse keratotomy. Surv Ophthalmol. 1989;34(2):73-106.
5. Shivitz IA, Arrowsmith PN, Russell BM. Contact lenses in the treatment of patients with overcorrected radial keratotomy. Ophthalmology. 1987;94(8):899-903.
6. Parminder A, Jacobs DS. Advances in scleral lenses for refractive surgery complications. Curr Opin Ophthalmol. 2015;26(4):243-8.
7. Weber SL, Ambrósio R, Lipener C, Coral-Ghanem C, Hofling-Lima AL. The use of ocular anatomical measurements using a rotating Scheimpflug camera to assist in the Esclera® scleral contact lens fitting process. Cont Lens Anterior Eye. 2016;39(2):148-53.
8. Lee AM, Kastl PR. Rigid gas permeable contact lens fitting after radial keratotomy. CLAO J. 1998;24(1):33-5.
9. Chu HS, Wang IJ, Tseng GA, Chen WL, Hou YC, Hu FR. Mini-scleral lenses for correction of refractive errors after radial keratotomy. Eye Contact Lens. 2018;44 Suppl 2:S164-8.
10. van der Worp E, Bornman D, Ferreira DL, Faria-Ribeiro M, Garcia-Porta N, González-Méijome JM. Modern scleral contact lenses: A review. Cont Lens Anterior Eye 2014;37(4): 240-50.

11. Weber SLP, Becco de SR, Gomes JÁP, Hofling-Lima AL. The use of the esclera scleral contact lens in the treatment of moderate to severe dry eye disease. Am J Ophthalmol. 2016;163:167-73.e1.

12. Kumar M, Shetty R, Dutta D, Rao HL, Jayadev C, Atchison DA. Effects of a semi-scleral contact lens on refraction and higher order aberrations. Cont Lens Anterior Eye. 2019;42(6):670-4.