Brief Communication

Troubleshooting Scleral Contact Lens Deposits: A Case Study

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ABSTRACT

Scleral contact lenses are extensively used in clinical practices; however, deposits on scleral lenses are still a prevalent problem among wearers. The current case presents an innovative method of troubleshooting scleral lens deposit. A 31-year-old Asian male, using scleral lens from past six years, presented with complaints of irritation and decreased vision due to heavy lens deposits. A novel in-office deep cleaning procedure was carried out using a specially created manual technique with a specific cleaning solution to break up the surface deposits without damaging lens. After cleaning, the patient demonstrated better visual acuity, less discomfort, and long wearing time. A low-cost innovative cleaning technique can effectively increase life of scleral lens and improve patient comfort.

Keywords: Scleral Lenses, Contact Lens Deposits, Contact Lens Deposits, Contact Lens Care.

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INTRODUCTION

Scleral lenses are type of rigid contact lenses designed to curve above the cornea and rest on the conjunctiva. There are three areas/zones: central optical area, adjoining transition area, and peripheral contact area.[1] They are used to correct various refractive errors such as high myopia, hyperopia and astigmatism.[2] Furthermore advancements in modern scleral lens design have enabled its application for presbyopia, corneal ectasia, keratoconus and steven Johnson syndrome as well.[3,4] However, Factors such as tear film composition, type of lens material, care regimen and cleaning can influence the formation and severity of contact lens deposits that can affect lens' performance, patient comfort, and ocular health.[5] We describe a case report of contact lens deposits. This report adhered to the institutional and regional ethical standards for human research and Declaration of Helsinki, 1975, amended in 2000.

Case Presentation

A 31-year-old Asian male presented with complaints of ocular discomfort, decreased vision, and reduced wearing time of scleral contact lenses over the past one year. The patient reported wearing scleral contact lens for 8-10 hours for the past six years. The patient denied history of smoking and systemic illness. He was a software engineer with screen time of 8-10 hours. He had known history of advanced keratoconus in both eyes and had undergone corneal collagen cross linking with riboflavin in 2012.Upon examination his unaided visual acuity was 6/18 in both eyes, improving to 6/12 with scleral lenses. Contrast sensitivity, assessed with Pelli-Robson chart, was reduced to 1.20 log units in both eyes.

Slit lamp examination showed paracentral corneal opacity in the epithelium, but not hiding the underlying iris details. Tear film debris and multiple surface deposits were noted on the anterior surface of

Table 1: *Parameters and outcomes of Different historical scleral lens trialsL2,L3, and L5 indicates variation in landing zone design curvature, higher values represent steeper peripheral alignment.*

S. No.	Trial Number	Eye	Landing Zone Design	Sagittal Depth	Power	Diameter	Over the Lens Refraction	Distance Vision	Near Vision
1.	Trial 1	OD	L3	5.23	-8.00 D	16.00	-1.00 D	6/9(-3)	N6
2.	Trial 2	OD	L5	5.05	-8.00 D	16.00	-3.50 D	6/9	N6
3.	Trial 3	OD	L5	5.31	-8.00 D	16.00	+1.25 D	6/9(-2)	N6
4.	Final Lens Parameter	OD	L5	5.31	-6.75 D	16.00	0.00 D	6/9	N6
5.	Trial 1	OS	L3	4.71	-3.00 D	16.00	+1.00 D	6/6	N6
6.	Trial 2	OS	L5	4.65	-3.00 D	16.00	+1.25 D	6/6(-3)	N6
7.	Trial 3	OS	L3	4.90	-5.00 D	16.00	+3.00 D	6/6	N6
8.	Trial 4	OS	L2	4.84	-3.00 D	16.00	+1.00 D	6/6(-2)	N6
9.	Final Lens Parameter	OS	L2	4.84	-2.00 D	16.00	+1.00 D	6/6	N6

*L3- Landing Zone Design
*OD- Oculus Dexter [Right eye]
*OS- Oculus sinister [Left eye]
*D- Diopter

scleral contact lens as shown in Figure 1. Based on previous fitting records from 2018, the patient had undergone scleral contact lens trial, with the McAsfeer mini scleral lenses (BostonXO2 material).

Table 1 summarizes historical trail parameters conducted during initial fitting period. At the current visit in 2024 no new trials were performed as patient was using his existing lenses. Instead, evaluation was focused on scleral lens deposits and management of the same.

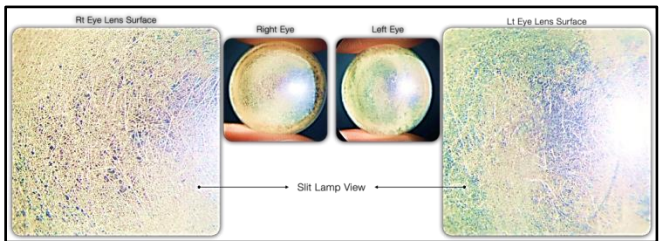

Figure 1: Illustrates lens at the time of recent visit.

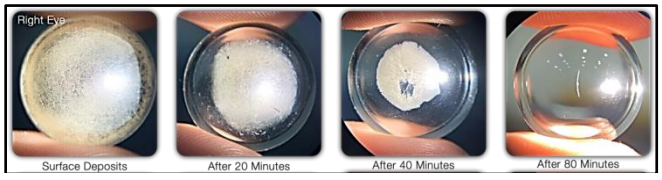

Figure 2 (A): Right eye Scleral contact lens showing surface deposits before and after peroxide cleaning.

The scleral lens was cleaned in-office using a peroxide-based disinfection system that consists of sodium hypochlorite and Potassium Bromide diluted with distilled water. The lenses were initially cleaned using GP solution (Hydrogen peroxide-based solution for scleral lens cleaning). The lenses were then kept in a dry case and sodium hypochlorite diluted with distilled water was poured until lens was submerged. Solution made by pouring Potassium Bromide diluted with distilled water in the same case with equal amount. Once colour of the compound was changed to yellow, the lens was kept soaked for minimum of 20 minutes. This procedure can be repeated several times in-case of heavy deposits on lens surface as shown in Figure-2. Cleaning and rinsing of lens were done with GP solution and lenses were soaked in GP solution overnight. The lenses were rinsed again with GP solution before wearing.

Figure 2 (B): Left eye Scleral contact lens showing surface deposits before and after peroxide cleaning.

Following re-insertion, the patient experienced significant improvement in vision clarity and comfort. Visual acuity improved from 6/12 to 6/6 (Snellen) in both eyes, and contrast sensitivity on Pelli-Robson chart improved from 1.20 to 1.80 log units. These findings confirmed that deposits were primarily a reason for reduced vision and discomfort.

DISCUSSION

This case demonstrates the challenges associated with prolonged use of scleral lens, which can affect vision, wearing time of lenses, ocular comfort, and ocular surface health. The patient had been using scleral lenses for six years but over time, significant deposits were accumulated on the lens surface which led to reduced visual acuity. The novelty of this case is the documentation of progressive deposition over the surface of lens after a long-term usage, of scleral lens in the absence of any ocular or systemic illness. Typically, complications are linked to initial adaptation of scleral lenses wear; however, this case highlights that chronic deposition can also occurs in well-fitted lenses after years of successful wear. This finding contributes to the current knowledge that long-term scleral lenses usage can lead to significant alterations in lens surface characteristics and can impact both visual performance and patient compliance.

Deposits on scleral lenses are primarily composed of proteins, lipids, calcium, mucin, and environmental contaminants.[6] This can result papillary conjunctivitis, punctate keratitis, corneal inflammation, and potentially microbial keratitis.[7] Complications of contact lenses affect 5% of lens wearers each year.[8] The composition and stability of tear film, plays major role in rate and type of deposits formation. The patient was fitted with lenses made up Boston XO2 material, which has high oxygen permeability (DK value of 141). While this material provides excellent oxygen transmission, its surface characteristics can still affect rate of deposit formation, especially if cleaning and maintenance of lens is not performed properly.

A clear vision and ideal ocular health depend on appropriate scleral lens fitting. Achieving optimal fit requires balancing parameters such as sagittal depth, base curve, and lens power to ensure adequate corneal clearance, centration, and tear exchange. Adequate fitting of lens minimizes risk of corneal touch, excess vaulting and tear stagnation- which are the factors that may promote deposits formation.[5]

In this case the patient had undergone a series of trial lens fittings with different parameters to achieve optimal alignment. The final lens parameters allowed enough tear flow and avoided excessive vaulting, thereby reducing the likelihood of debris and proteins to be entrapped under the lens. However, long term use can still result in lens deposits. For long term scleral lens users, in-office professional cleaning plays a significant role in maintaining the optical quality and visual comfort. While at home, cleaning can remove superficial debris, but it may not remove deep protein or lipid deposits. In contrast an in-office hydrogen peroxide-based cleaning system can successfully dissolve deposits and restores transparency and comfort of lens.

CONCLUSION

This case highlights that surface deposits on scleral lenses can significantly affect visual acuity. An in-office cleaning protocol using a hydrogen peroxide disinfection system, was performed with 20 minutes of settling period and overnight neutralization period prior to reinsertion which effectively restored visual acuity and contrast sensitivity. This emphasizes importance of regular professional cleaning and maintenance of scleral lens to ensure long term success and safety of scleral lens wear.

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Patient's Consent: Researchers followed the guidelines set forth in the Declaration of Helsinki.

Conflict of Interest: Authors declared no conflict of interest.

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